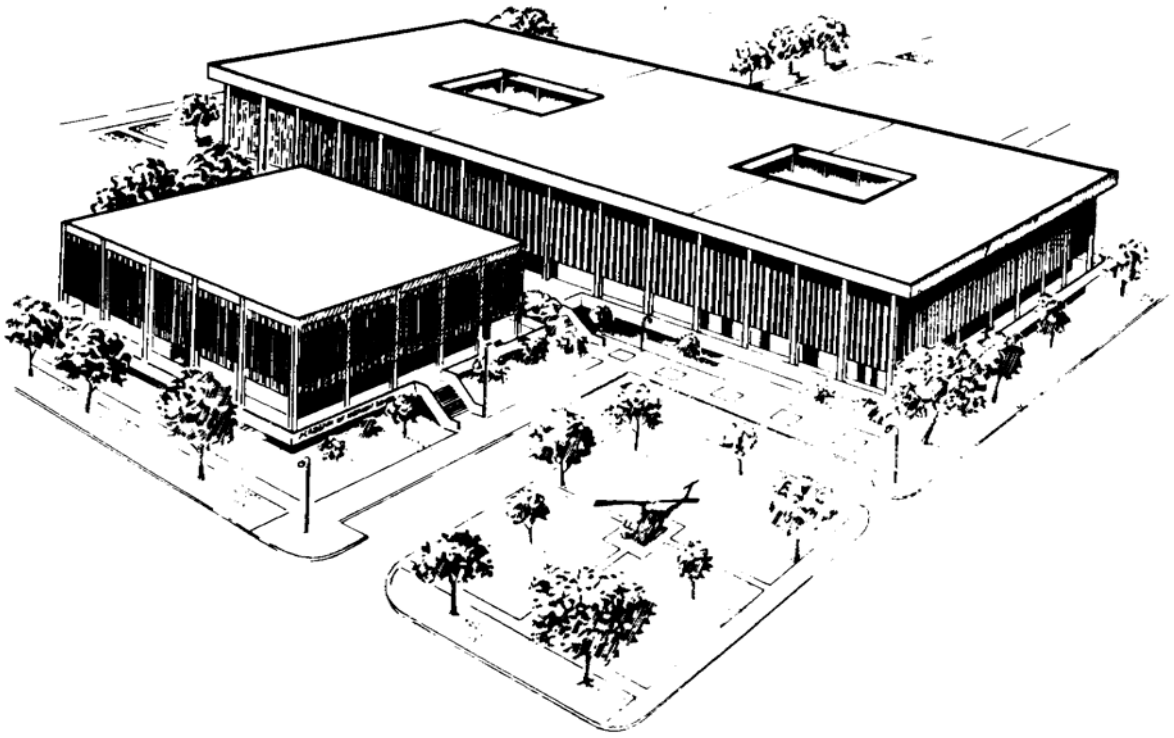
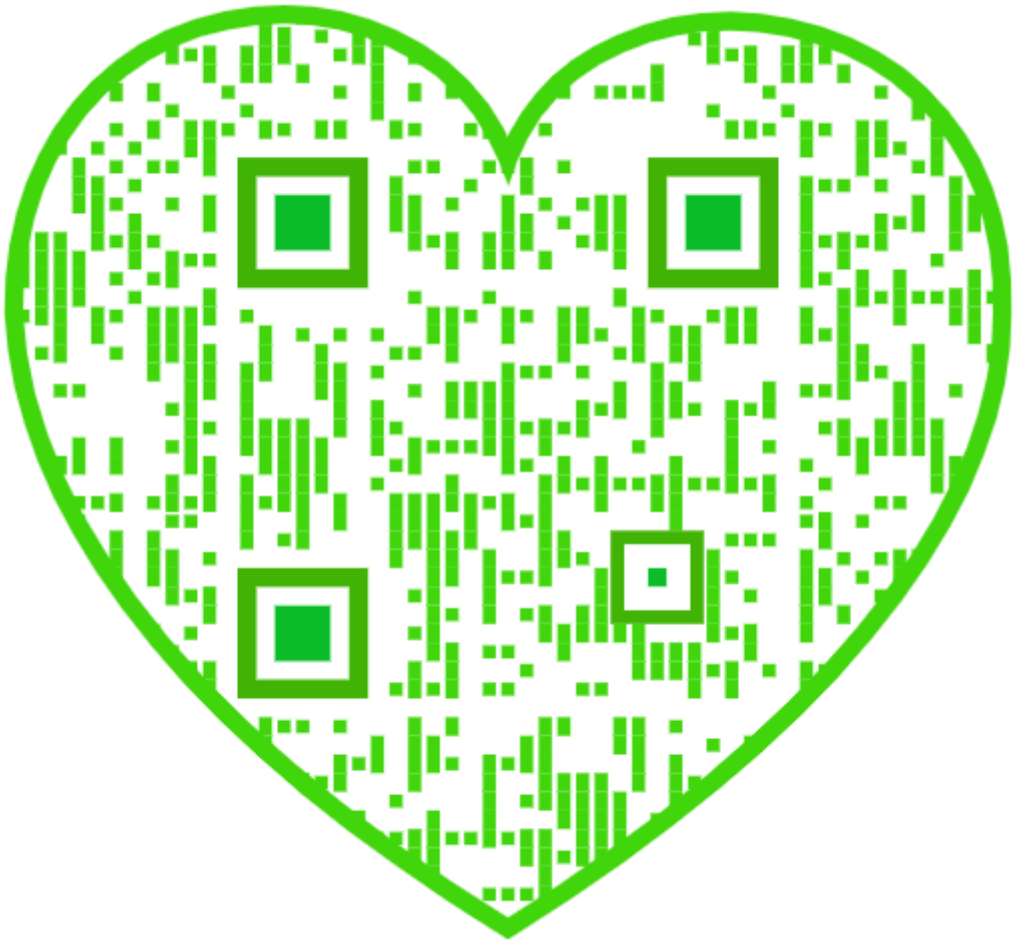
U.S. ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL
FORT SAM HOUSTON, TEXAS 78234-6100



NURSING CARE RELATED TO THE SENSORY AND NEUROLOGICAL SYSTEMS

SUBCOURSE MD0919 EDITION 100



DEVELOPMENT

This subcourse is approved for resident and correspondence course instruction. It reflects the current thought of the Academy of Health Sciences and conforms to printed Department of the Army doctrine as closely as currently possible. Development and progress render such doctrine continuously subject to change.

ADMINISTRATION

For comments or questions regarding enrollment, student records, or shipments, contact the Nonresident Instruction Section at DSN 471-5877, commercial (210) 221-5877, toll-free 1-800-344-2380; fax: 210-221-4012 or DSN 471-4012, e-mail accp@amedd.army.mil, or write to:

COMMANDER
AMEDDC&S
ATTN MCCS HSN
2105 11TH STREET SUITE 4192
FORT SAM HOUSTON TX 78234-5064

Approved students whose enrollments remain in good standing may apply to the Nonresident Instruction Section for subsequent courses by telephone, letter, or e-mail.

Be sure your social security number is on all correspondence sent to the Academy of Health Sciences.

CLARIFICATION OF TRAINING LITERATURE TERMINOLOGY

When used in this publication, words such as "he," "him," "his," and "men" are intended to include both the masculine and feminine genders, unless specifically stated otherwise or when obvious in context.

.

USE OF PROPRIETARY NAMES

The initial letters of the names of some products are capitalized in this subcourse. Such names are proprietary names, that is, brandnames or trademarks. Proprietary names have been used in this subcourse only to make it a more effective learning aid. The use of any name, proprietary or otherwise, should not be interpreted as an endorsement, deprecation, or criticism of a product. Nor should such use be considered to interpret the validity of proprietary rights in a name, whether it is registered or not.

.

TABLE OF CONTENTS

Lesson		Paragraphs
	INTRODUCTION	
1	NURSING CARE RELATED TO THE SENSORY SYSTEM	
	Section I. Introduction to the Special Senses	1-1--1-6
	Section II. Assessment	1-7--1-11
	Section III. Treatments and Procedures	1-12--1-17
	Section IV. Disorders of the Eye	1-18--1-23
	Section V. Disorders of the Ear	1-24--1-28
	Exercises	
2	NURSING CARE RELATED TO THE NEUROLOGICAL SYSTEM	
	Section I. Anatomy and Physiology	2-1--2-10
	Section II. Neurological Assessment	2-11--2-16
	Section III. Diagnostic Procedures	2-17--2-21
	Section IV. Care of the Unconscious Patient	2-22--2-27
	Section V. Infectious Nervous System Disorders	2-28--2-32
	Section VI. Degenerative Nervous System Disorders	2-33--2-36
	Section VII. Cranial Nerve Disorders	2-37--2-38
	Section VIII. Head and Spine Injuries	2-39--2-41
	Section IX. Disorders of the Brain	2-42--2-45
	Exercises	

CORRESPONDENCE COURSE OF THE
U.S. ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL

SUBCOURSE MD0919

NURSING CARE RELATED TO THE SENSORY AND NEUROLOGICAL SYSTEMS

INTRODUCTION

A patient is not a passive object on which we perform nursing care procedures. A patient should never be thought of, or discussed, as merely a condition or injury. It is not acceptable to think of, or refer to, your patient as "the gallbladder" or "the fractured hip" or "the bleeding ulcer." A patient is much more than the condition that brought him to the hospital. A patient is a human being, possessing physical and emotional needs and wants.

The relationship between the patient and the nursing staff is extremely dynamic and personal. The patient places his trust in the nursing staff and they, in return, must utilize all their knowledge and skills to ensure the patient's well-being and assist in his return to good health and independence. This is accomplished by developing a therapeutic relationship between the patient, his family, and the health care professionals.

The nursing paraprofessional relates very closely with the patient and his family by virtue of his participation in providing nursing care and his presence at the bedside. It is often the nursing paraprofessional who makes the initial observation that something is not as it should be. Nursing paraprofessionals who are responsible, educated, and observant are assets to the therapeutic environment necessary for patient recovery. To help foster this therapeutic environment, the nursing paraprofessional must do the following:

Assess the patient's ability to express himself.

Assess the patient's mechanisms for coping.

Assess the patient's level of understanding about his condition and the teaching provided by the health care professionals.

Assist the patient to establish a trusting relationship with the health care providers.

Utilize the nursing process to provide the best possible care.

Continue to pursue his own education in order to sustain and enhance professional knowledge and skills.

The purpose of this subcourse is to enhance your knowledge of medical surgical nursing care related to the sensory and neurological systems and the role of the nursing paraprofessional in providing that care.

Subcourse Components:

This subcourse consists of two lessons. The lessons are as follows:

Lesson 1, Nursing Care Related to the Sensory System.
Lesson 2, Nursing Care Related to the Neurological System.

Credit Awarded:

To receive credit hours, you must be officially enrolled and complete an examination furnished by the Nonresident Instruction **Section** at Fort Sam Houston, Texas. Upon successful completion of the examination for this subcourse, you will be awarded 12 credit hours.

You can enroll by going to the web site http://atrrs.army.mil and enrolling under "Self Development" (School Code 555).

A listing of correspondence courses and subcourses available through the Nonresident Instruction Section is found in Chapter 4 of DA Pamphlet 350-59, Army Correspondence Course Program Catalog. The DA PAM is available at the following website: http://www.usapa.army.mil/pdffiles/p350-59.pdf.

LESSON ASSIGNMEN

LESSON 1 Nursing Care Related to the Sensory System.

TEXT ASSIGNMENT Paragraphs 1-1 through 1-28.

LESSON OBJECTIVES After completing this lesson, you should be able to:

1-1. Identify the special senses.

1-2. Name the stimulus for each of the special senses.

1-3. Identify the receptor organ for each of the special senses.

1-4. Name the two sensory functions of the ear.

1-5. Explain the process by which airborne sound waves are converted to nerve impulses.

1-6. Name the two types of gravitational forces that provide sensory input for equilibrium.

1-7. Define direct pupil reaction.

1-8. Define consensual pupil reaction.

1-9. Identify the steps in instilling eyedrops or ointments.

1-10. Identify the steps in irrigating the eye.

1-11. Identify the steps in instilling ear drops.

1-12. Identify the steps in irrigating the ear.

1-13. Define myopia.

1-14. Define hyperopia.

1-15. Define presbyopia.

1-16. Define conjunctivitis.

1-17. Identify the nursing implications in caring for a patient undergoing ophthalmic surgery.

1-18. Identify the nursing implications in caring for a patient with vision loss.

1-19. Identify 4 types of hearing loss.

1-20. Identify steps in removal of a foreign body from the ear.

SUGGESTION

After studying the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 1

NURSING CARE RELATED TO THE SENSORY SYSTEM

Section I. INTRODUCTION TO THE SPECIAL SENSES

1-1. THE SPECIAL SENSES

a. The human body is continuously bombarded by all kinds of stimuli. Some of these stimuli are received by sensory receptors distributed throughout the entire body. Other stimuli are received by highly complex receptor organs. These are referred to as the special senses.

b. From each special sense organ, information is sent to the brain through specific cranial nerves. When the information reaches the specific area of the brain's cerebral cortex, it is perceived at the conscious level as sight, sound, smell, taste, and balance. These special senses allow us to detect changes in our environment, providing information necessary for homeostasis.

c. The Special Senses are:

(1) Sight.

(a) The receptor organ is the eye.

(b) The stimulus is light rays.

(2) Hearing.

(a) The receptor organ is the ear (cochlea).

(b) The stimulus is sound waves.

(3) Smell.

(a) The receptor organ is the nose (olfactory hair cells).

(b) The stimulus is airborne molecules.

(4) Taste.

(a) The receptor organs are the taste buds in the mouth.

(b) The stimulus is fluid-borne molecules.

(5) Balance (equilibrium).

(a) The receptor organ is the ear (membranous labyrinth).

(b) The stimulus is gravitational forces.

1-2. SMELL

Located in the upper recesses of the nasal chambers is a special layer of tissue called olfactory epithelium. Within the olfactory epithelium are special hair cells (chemoreceptors) that react to airborne molecules. Information received by the hair cells is transmitted from the olfactory nerves to the olfactory bulbs and along the olfactory tract to the brain, where it is interpreted as the sensation of smell.

1-3. TASTE

Located on the tongue and back of the mouth are sensory receptors called taste buds. Special hair cells in the taste buds are chemoreceptors that react to molecules of material taken into the mouth (food, liquids, and so forth.). Information received by the hair cells is transmitted to the brain, where it is interpreted as the sense of taste.

1-4. VISION

The eye (figure 1-1) is the special sense organ responsible for vision. Rays of light (reflected from an object) pass through the cornea, aqueous humor, pupil, lens, and vitreous humor to stimulate the receptor tissue (rods and cones) in the retina. The resulting nerve impulses travel to the brain, where they are interpreted as sight.

1-5. HEARING

The human ear (figure 1-2) serves two major sensory functions--hearing and equilibrium.

a. Sound stimuli travel as airborne waves, which are collected by the external ear. The airborne waves pass through the external auditory meatus (ear canal) to the tympanic membrane, which separates the external and middle ear.

b. The physical vibration of the airborne waves is converted to mechanical vibration by the tympanic membrane and the ossicles. The ossicles (malleus, incus, and stapes) articulate with both the tympanic membrane and the oval window, which opens into the vestibule of the inner ear.

c. When the ossicles are set into mechanical vibration, the stapes acts as a plunger against the oval window, imparting pressure pulses to the fluid (perilymph) of the inner ear.

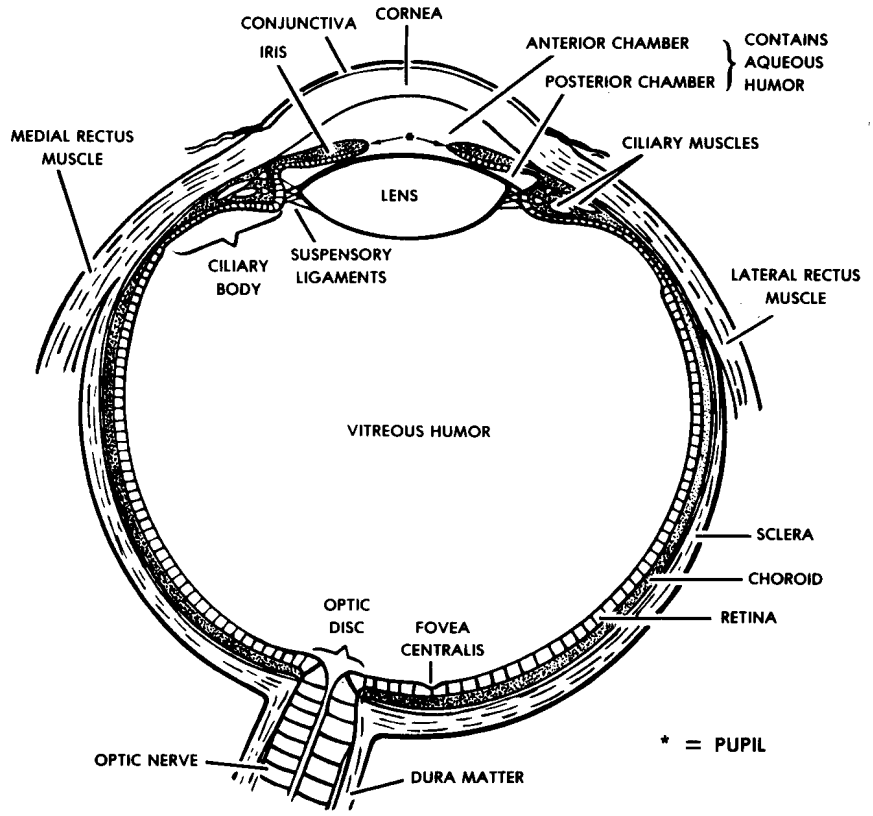


Figure 1-1. The eye.

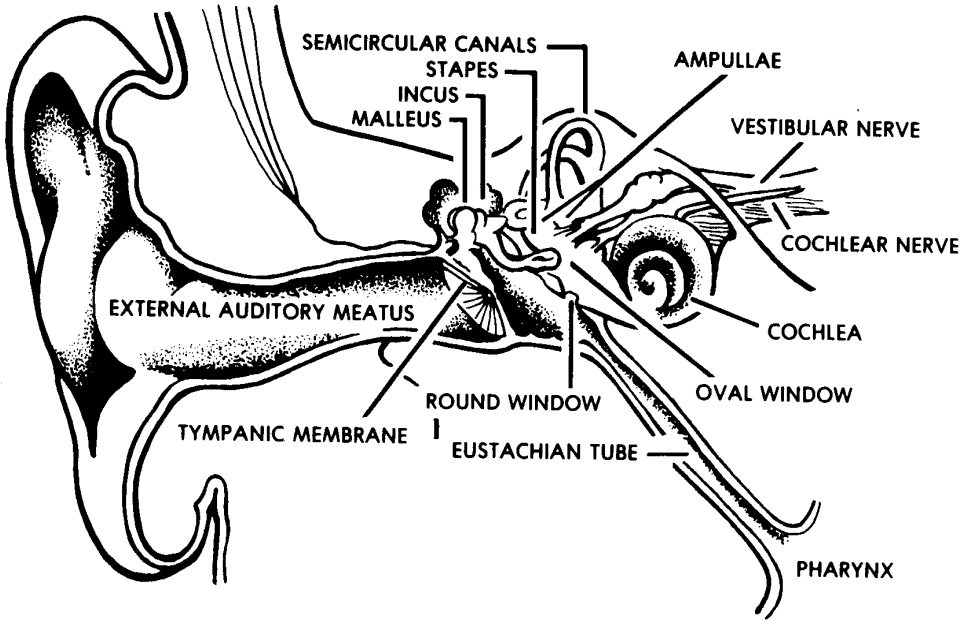


Figure 1-2. The ear.

d. Fluid vibrations of the perilymph are converted to nerve impulses when the hair cell receptors within the cochlea are stimulated by the fluid vibrations. The nerve impulses are carried to the brain where they are interpreted as sound.

1-6. EQUILIBRIUM

a. Equilibrium is the state of balance of the body. Through a variety of sensory inputs and postural reflexes, the body can be maintained in a desired posture. All of the various sensory inputs related to the maintenance of equilibrium and posture are integrated within the brain as "body sense." The internal ear provides one of the input systems for general body sense.

b. A primary sensory input for equilibrium consists of gravitational forces. Gravitational forces are of two types: static, when the body is standing still, and kinetic, when the body is in motion. Kinetic motion may be in a straight line (linear), or in an angular direction (curvilinear).

c. The fluid-filled membranous labyrinth of the inner ear has two sac-like structures called the sacculus and the utriculus. On the wall of each sac is a collection of special hair cells, which serve as receptors for static and linear kinetic gravitational forces.

d. Associated with the utriculus are three tubular structures called the semicircular canals. Two of the semicircular canals are vertically oriented and the third is essentially horizontal. All three semicircular canals are oriented at right angles to each other.

e. Each semicircular canal ends with an enlarged area where it opens into the utriculus. This area is called the ampulla. On the wall of each ampulla, at a right angle to the axis of the canal, is a little ridge of hair cells. The hair cells bend in directional response to the kinetic gravitational forces initiated by movement of the head.

f. All the information from the hair cells of the sacculus, utriculus, and ampullae is transmitted to the brain by the vestibular nerve. The vestibular and auditory nerves are contained within the same fibrous sheath from the inner ear to the brain. Within the brain, the two nerves split into different pathways.

Section II. ASSESSMENT

1-7. EXAMINATION OF THE EYE

An examination of the eye includes an external examination, examination by ophthalmoscope, and an assessment of the functions of the eye.

a. **External Examination.** The anterior segment of the eyes and their appendages can be examined by visual inspection.

(1) Note the general appearance of the eyelids, eyelashes, and lacrimal apparatus. Observe for:

(a) Redness around the eye.

(b) Discharge or crusting.

(c) Growths on eyes or eyelids.

(d) Excessive tearing.

(2) Position and mobility can be observed by having the patient rotate the eyes, looking up, down, and to each side.

b. **Pupillary Response.** Normal pupils are rounded, centrally placed, and generally equal in size. (About 25 percent of normal individuals have pupils slightly unequal in size.)

(1) Reaction to light. Seat the patient in an area with even lighting and instruct him to fix his gaze on a distant object. Cover one eye and shine a flashlight in front of the exposed eye. The pupil should contract (constrict) because of the light. This response is called a direct reaction. The covered pupil should also contract. This response is called a consensual reaction.

(2) Near point reaction. When the gaze is changed from a distant object to an object close at hand, the pupils should contract.

c. **Ophthalmoscopic Examination.** By looking through the various lenses of an ophthalmoscope, the trained examiner can view and assess the internal structures of the eye. This examination is routinely performed by the physician.

d. **Functional Examinations.**

(1) Focusing power (power of accommodation) is tested by placing a line of print close to the eye, then slowly moving it back to the point at which the patient is able to read it. The nearest point at which it is readable is the near point of accommodation.

(2) Visual field refers to all that can be seen with both eyes fixed straight ahead. To perform a gross examination of visual field, the confrontation method is used (figure. 1-3). Have the patient and the examiner face each other at a distance of about 2-3 feet, each focusing his gaze at the other's nose. The examiner should then extend his arm to the side, point his finger, and slowly move his arm back in, along a plane half-way between himself and the patient. The examiner's finger should appear in the patient's visual field at the same time the examiner sees it (assuming the examiner's visual field is grossly normal).

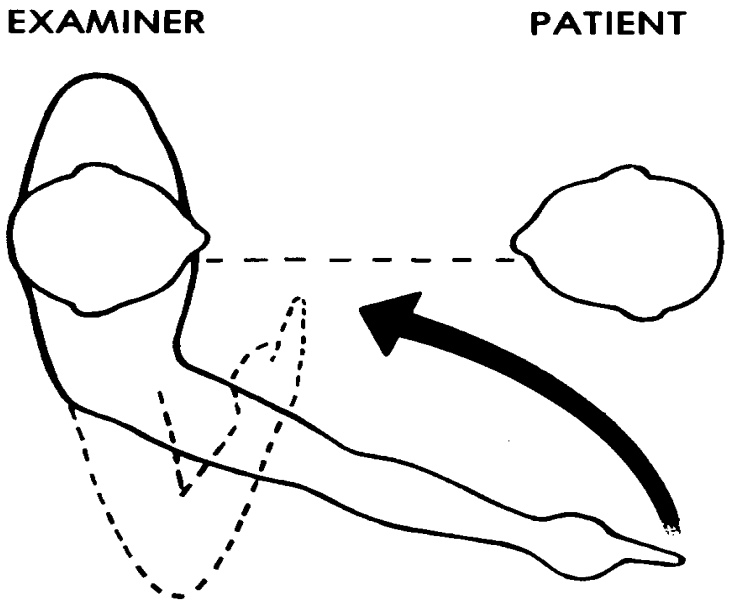


Figure 1-3. Confrontation method.

(3) Color sense is tested by using specially designed color plates to distinguish reds, greens, and blues.

(4) Visual acuity testing is done with the Snellen chart or one of its modifications. Each eye is tested separately, both with and without glasses, if worn.

(a) Since the distance at which rays of light from an object are practically parallel and no accommodation of the lens is necessary to focus the object, the test is performed at a distance of 6 meters (20 feet),

(b) The Snellen chart contains rows of letters of varying sizes, arranged to that the normal eye can see them at distances of 6, 9, 12, 15, 21, 30, and 60 meters. (20, 30, 40, 50, 70, 100, and 200 feet.) If a patient is seated 6 meters (20 feet) from the chart and can read the line of letters for 6 meters, his vision is expressed by the fraction 6/6 (or 20/20).

(c) Vision is expressed by a fraction, the numerator denoting the distance at which the test was performed (normally, 6 meters or 20 feet), and the denominator denoting the smallest line of letters which could be read at that distance. If a patient is seated 6 meters from the chart and the smallest line of letters he is able to read is the one that should be read at a distance of 30 meters, then his vision is expressed at 6/30 (or 20/100).

(d) If the largest letters on the chart cannot be read at a distance of 6 meters, the patient is moved toward the chart until he can read the largest letters. Vision is then expressed as a fraction, with the numerator denoting the distance at which the largest line could be read, and the denominator denoting the number of the largest line.

(e) If the patient cannot read the largest line at a distance of one meter, the examiner tests the patient's ability to see hand motion in front of his face. If the patient cannot see the examiner's hand at a distance of one or two meters, he is tested for light perception. A light is flashed from different directions and the patient is asked from which direction the light appears and when it goes on and, it goes off. If the patient can do this, the examination is recorded as "light perception present". If no light perception is present, a person is technically blind.

(5) These functional examinations are routinely performed by the physician or eye specialist. However, it is recommended that nursing personnel be knowledgeable of these examinations. To do so will facilitate identification of visual abnormalities. A gross examination using "field expedient techniques" can be performed when the proper equipment and personnel are not available. For example:

(a) Color sense can be observed by having the patient identify the color of objects around him.

(b) Gross acuity can be tested by having the patient read signs posted on the walls. Use signs of different sizes and position the patient at varying distances.

1-8. ASSESSING SYMPTOMS

In addition to the examinations mentioned previously, the patient should be assessed for the following:

a. Discomfort or pain in or around the eye.

b. Photophobia. (Abnormal sensitivity to light.)

c. Nystagmus. (Involuntary, rapid movement of the eyeball. May be horizontal, vertical, rotational, or mixed.)

d. Strabismus. (Deviation of the eye from the normal physiological axis: "crossed eyes.")

e. Diplopia. (Seeing an object in double: "double vision.")

f. Blurred vision.

g. "Spots" or "lights" in the visual field.

1-9. EXAMINATION OF THE EAR

a. The auditory canal is examined by means of an otoscope and ear speculum. The patient normally sits in an upright position for the exam. The lighted otoscope is inserted, using the largest speculum that will fit comfortably into the patient's external ear canal.

b. Look through the eyepiece and examine the external ear canal for:

(1) Discharge.

(2) Impacted cerumen.

(3) Inflammation.

(4) Masses.

(5) Foreign bodies.

c. Examine the tympanic membrane for:

(1) Luster.

(2) Transparency.

(3) Integrity.

(4) Scarring.

(5) Color.

1-10. AUDIOMETRY

a. Hearing tests are conducted with a device called an audiometer. This apparatus produces sounds of specific frequencies and intensities. The patient sits in a soundproof room and listens to the sounds over a set of earphones. Sounds of varying frequency and intensity are than transmitted to each ear separately. The patient signals when a sound is heard by raising his hand or pressing a button to indicate which ear heard the sound. When a sound is transmitted and the patient does not signal, the examiner records that the sound was not heard.

b. When this equipment is not available, a gross examination can be performed using "field expedient techniques." Have the patient sit with eyes closed and ask him to identify sounds made by an examiner moving in a perimeter around the patient. The patient should identify from which direction the sound originated and the type of sound heard. Sounds can be created by whistling, whispering, tapping, playing a radio, and so forth.

1-11. ASSESSING SYMPTOMS

In addition to the examinations mentioned above, the patient should be evaluated for signs that may be indicative of hearing defects.

a. Failure to react to loud noises.

b. Inattentiveness in a group conversation.

c. Inappropriate responses in conversation.

d. Facial expressions which indicate a difficulty in understanding what has been said.

e. Habitually asking "what?"

f. Speaking in a loud or monotonous voice.

g. Speech that is slurred or unclear.

h. Complaint of ringing, buzzing, or roaring in the ears. (Tinnitus)

i. Sensation of pressure or fullness in the ears.

j. Discomfort or pain in or around the ears.

k. Light-headedness, dizziness, or loss of balance.

Section III. TREATMENTS AND PROCEDURES

1-12. PRECAUTIONS FOR THE EYES

To prevent injury to the eye and to apply the most effective methods of treatment, it is necessary to understand and practice safety precautions.

a. **Cleansing the Eyelids**. The eyelids are always cleansed prior to the instillation of any medication and the application of compresses and dressings. The eyelids must also be cleansed after the dressings are removed following eye surgery.

(1) The eyelids are cleansed with 2x2-inch gauze squares moistened in sterile normal saline or with a solution prescribed by the physician. With the patient's eyes closed, wipe gently from the inner canthus (corner) to the outer canthus. Be careful not to exert any pressure on the globe.

(2) Use a fresh piece of gauze for each stroke.

b. **Positioning**. Proper positioning of the patient prior to giving eye treatments is important to ensure that the head is under control and the eye is properly opened.

(1) When the patient is seated in a chair, the care giver may stand behind the patient to give support to the head.

(2) A patient lying in bed has sufficient support from the bed.

(3) To prevent injury when instilling drops or ointments, brace the hand holding the medication on the patient's forehead. This prevents your hand from shaking, and allows your hand to move with the patient.

(4) To prevent the spread of infection when irrigating the eye, tilt the patient's head toward the affected side so that the solution will flow from the inner canthus to the outer canthus. Do not allow the solution to flow across the nose into the unaffected eye. Do not touch the eye with the irrigating equipment.

1-13. INSTILLING EYE DROPS OR OINTMENTS

a. Review the patient's clinical record to verify the order.

b. Wash your hands and assemble the necessary equipment.

(1) Prescribed medication.

(2) Normal saline solution.

(3) Two by two inch gauze squares.

(4) Tissues.

c. Approach and identify the patient.

d. Explain the procedure and the purpose of the medication to the patient.

e. Provide for privacy, if appropriate.

f. If the patient is wearing an eye dressing, remove it by gently pulling down and away from the forehead. Discard the dressing and wash your hands.

g. Remove any accumulation of discharge by cleansing around the eye. Use the procedure outlined in paragraph 1-12a.

(1) If secretions are crusted, apply a moistened gauze square over the closed eye and leave in place for several minutes.

(2) Reapply as necessary until secretions are soft enough to be removed without traumatizing the mucosa.

h. Position the patient.

(1) Supine in bed is the position of choice.

(2) Seated in a steady chair is acceptable.

i. Prepare the medication.

(1) Remove the cap of the medication container, being careful to avoid contamination of the cap.

(2) If administering drops with a measured dropper, fill the dropper to the prescribed dose. (Many medications come in plastic containers that deliver a set dose per drop when the container is gently squeezed.)

(3) If administering an ointment, squeeze out a small amount onto to a sterile gauze square in order to remove any crust that may have formed. Discard the gauze.

j. Instill the medication.

(1) Steady the hand holding the medication against the patient's forehead.

(2) Instruct the patient to look up and to the side.

(3) With your free hand, gently pull down the lower lid of the affected eye, exposing the conjunctival sac.

(4) Instill the prescribed amount of drops or a thin ribbon of ointment into the conjunctival sac (figure 1-4). NEVER instill the medication directly onto the eyeball.

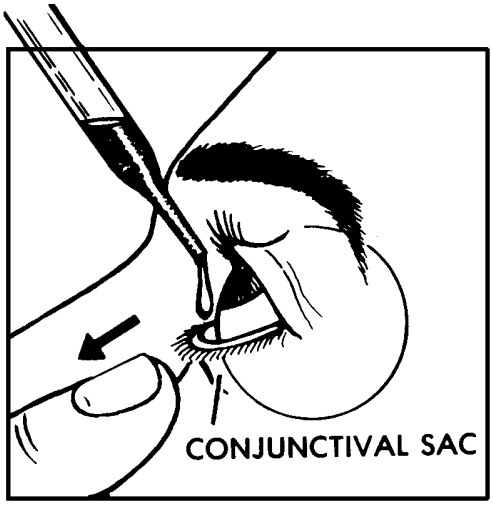


Figure 1-4. Instilling eye drops.

k. Instruct the patient to close the eyes gently (without squeezing the lids shut), and roll the eyes. This will distribute the medication.

l. Remove any excess solution or ointment from around the eye by blotting gently with a clean tissue or gauze square.

m. Apply a fresh dressing if required.

n. Provide for the patient's comfort.

o. Remove supplies from the bedside and store or discard as appropriate.

p. Wash your hands.

q. Record the procedure in the patient's clinical record.

1-14. IRRIGATING THE EYE

a. Wash your hands and assemble the necessary equipment.

(1) Towel.

(2) Chux pads.

(3) Sterile gauze pads.

(4) Tissues.

(5) Irrigation solution (at room temperature).

(6) Emesis basin.

b. Approach and identify the patient.

c. Explain the procedure to the patient.

d. Assist the patient into the supine position, with the head turned toward the affected side.

e. Place a chux pad under the patient's head to protect the bed linen. Place an emesis basin against the affected side, next to the cheek, to catch the solution as it runs off.

f. Using the thumb and index finger of your non-dominant hand, separate the patient's eyelids.

g. Perform a moderate irrigation:

(1) Direct a constant flow of irrigation solution toward the inner canthus of the eye. Administer about one-half of the solution in the bottle. (Bottles of sterile ophthalmic irrigation solution are available for moderate irrigations.)

(2) Inspect the eye for foreign particles.

(3) Attempt to remove particles by touching them gently with a piece of sterile gauze that has been moistened with the solution. The particle should adhere to the gauze.

(4) Continue irrigation until the eye is clean or the prescribed amount of solution has been used.

h. Perform a copious irrigation:

(1) Attach IV tubing to a 1000cc container of sterile normal saline solution.

(2) Open the flow clamp, and direct a stream of fluid toward the inner canthus of the eye. Do not allow the end of the IV tubing to touch the eye.

(3) Periodically stop the flow of solution and inspect for foreign particles. If particles are seen, attempt to remove them in the same manner as described in g.(3) above.

(4) Continue the irrigation until the eye is clean or the prescribed amount of solution has been used.

i. Dry the eyelids by blotting gently from inner to outer corner with gauze squares.

j. Provide for the patient's comfort.

k. Remove supplies from the bedside and store or discard as appropriate.

l. Wash your hands.

m. Record the procedure in the patient's clinical record.

1-15. APPLYING EYE DRESSINGS

a. Wash your hands and assemble the necessary equipment.

(1) Sterile eye dressings (gauze squares or pre-cut eye patches).

(2) Hypoallergenic tape.

b. Approach and identify the patient. Explain the procedure.

c. Inspect the eyes for discharge or crusting, and cleanse the eyes.

d. Instruct the patient to close both eyes.

e. Place the patch gently over the affected eye. (If ordered by the physician, place a patch over the other eye as well. The physician will often prescribe a dressing for both eyes in order to help immobilize the affected eye.)

f. If the eye patches are not a self-adherent style, secure the patches in place with several pieces of hypoallergenic tape.

g. Provide for the patient's comfort and place the call bell within reach.

h. Remove supplies from the bedside and store or discard as appropriate.

i. Record the procedure in the patient's clinical record.

1-16. INSTILLING EAR DROPS

a. Review the patient's clinical record to verify the physician's order.

b. Wash your hands and assemble the necessary equipment.

(1) Prescribed medication.

(2) Cotton balls and gauze squares.

(3) Normal saline solution.

(4) Medicine dropper.

c. Approach and identify the patient.

d. Explain the procedure to the patient. Instruct him that it will be necessary to lie still for 10-15 minutes after the procedure.

e. Place the patient in a supine position with the head turned toward the unaffected side.

f. If necessary, cleanse the external ear with the saline and cotton balls or gauze squares.

g. Remove the cap from the medication container and, if a dropper is to be used, draw up the correct amount of medication. Do not contaminate the container cap.

h. With the non-dominant hand, straighten the external ear canal by gently pulling up and back on the ear for an adult, or down and back for a child.

i. Instill the prescribed amount of medication, one drop at a time.

(1) Direct the flow of the medication toward the roof of the ear canal.

(2) Do not allow the dropper (or the tip of the bottle) to touch the ear.

j. Place a cotton ball loosely into the opening of the ear canal to absorb any excess medication.

k. Instruct the patient to lie still for 10-15 minutes to allow the medication to be absorbed, rather than run out of the ear. (The head should remain turned toward the unaffected side.) After this period, assist the patient to a comfortable position.

l. Remove supplies from the bedside and store or discard as appropriate.

m. Wash your hands.

n. Record the procedure in the patient's clinical record.

1-17. IRRIGATING THE EAR

a. Review the patient's clinical record to verify the physician's order to irrigate the ear.

b. Wash your hands and assemble the necessary equipment.

(1) Ear irrigation syringe.

(2) Irrigating solution.

(3) Cotton balls and gauze squares.

(4) Emesis basin.

(5) Large basin.

(6) Sterile solution thermometer.

(7) Chux pads.

c. Fill the large basin with hot water and place the container of irrigating solution into it.

d. Approach and identify the patient.

e. Explain the procedure to the patient.

f. Clean the external ear with moistened cotton balls or gauze squares.

g. Wash your hands.

h. Test the temperature of the irrigating solution with the sterile solution thermometer. The solution should be between 95ºF-105ºF (body temperature) to avoid causing dizziness.

i. Assist the patient to a sitting position with the head tilted slightly forward and toward the affected side.

j. Place a chux pad over the patient's shoulders to keep clothing dry.

k. Fill the irrigating syringe with solution and expel all air from the syringe.

l. Instruct the patient to hold the emesis basin against his neck, directly under the ear to be irrigated.

m. Straighten the ear canal.

n. Point the tip of the irrigating syringe upward and toward the back of the ear canal.

o. Direct a steady stream of solution into the ear, aiming toward the roof of the ear canal (figure 1-5).

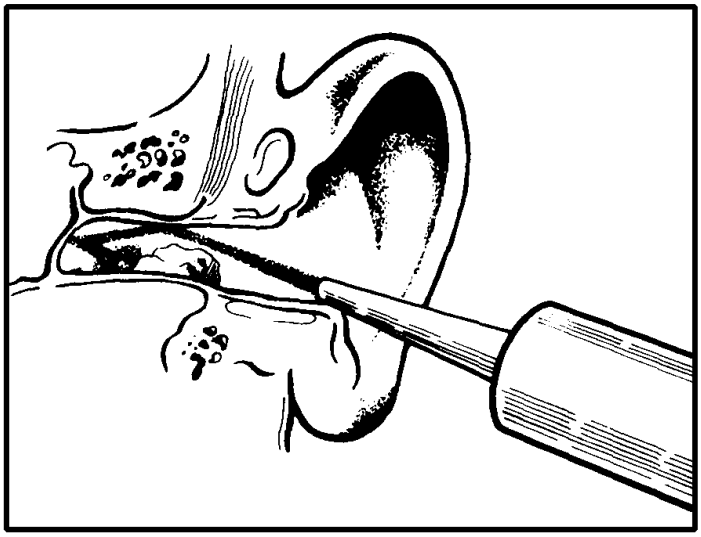


Figure 1-5. Irrigating the ear.

p. Observe the solution as it returns. Note the presence of cerumen or other matter.

q. Observe the patient for signs of pain, nausea, or dizziness. Stop the irrigation immediately if these symptoms occur. Report to the professional nurse at once. These symptoms could be the result of a disturbance in the middle or inner ear, or may indicate a damaged tympanic membrane.

r. Refill the syringe and repeat the procedure until the return flow of solution is clear, or all of the prescribed solution has been used.

s. Assist the patient to a recumbent position, lying on the affected side for several minutes to facilitate complete drainage of the ear canal.

t. Clean the ear and surrounding skin with moistened cotton balls. Blot dry.

u. Remove supplies from the bedside and store or discard as appropriate.

v. Wash your hands.

w. Record the procedure in the patient's clinical record.

Section IV. DISORDERS OF THE EYE

1-18. VISUAL DEFECTS

a**. Myopia.** Also referred to as "nearsightedness", myopia is a refractive error caused by a structural defect of the eye.

(1) The eyeball is too long from front to back, causing light rays to focus in front of the retina rather than on it.

(2) Close objects can be seen more clearly than distant objects, which appear blurred and unfocused.

(3) Vision may be corrected with the use of a concave lens, which will cause the light rays to focus on the retina.

b. **Hyperopia.** Also known as hypermetropia and "farsightedness", hyperopia is a refractive error caused by a structural defect of the eye.

(1) The eyeball is too short from front to back, causing light rays to focus behind the retina rather than on it.

(2) Distant objects can be seen more clearly than those close up. Near objects are blurred and unfocused.

(3) Vision may be corrected with the use of a convex lens, which will cause the light rays to focus on the retina.

c. **Presbyopia.** Presbyopia is a refractive error caused by a decrease in the power of accommodation of the crystalline lens, due to weakening of the ciliary muscles with aging.

(1) The near point of distinct vision becomes further from the eye. (This is why you may see someone reading while holding the reading material at arm's length.)

(2) Vision may be improved with the use of corrective lenses such as bifocals, which have a small lens for near vision placed within the lower half of a larger lens for distant vision.

d. **Astigmatism.** This is a refractive error caused by uneven curvature of the refractive surfaces of the eye.

(1) Light rays are not focused along equal planes because of the curvature, causing vision to be unfocused.

(2) Vision can be improved with the use of a lens called a cylinder lens, which compensates for the uneven curvature and allows the light rays to focus sharply.

e. **Cataract.** A cataract is an opacity of the crystalline lens or its capsule. It is the leading cause of blindness in the United States.

(1) Vision becomes distorted and/or unfocused. Bright lights produce a glare.

(2) Vision is improved by surgical removal of the opaque lens. The missing lens is compensated for by the use of special eyeglasses or contact lenses, or by intraocular implant of an artificial lens.

f. **Glaucoma.** Glaucoma is a condition in which there is increased pressure within the eyeball. If uncorrected, glaucoma will lead to blindness.

(1) Increased pressure is caused by faulty drainage of aqueous fluid.

(2) Drug therapy is used to promote drainage of the aqueous fluid, or decrease the production rate of the aqueous fluid, or both.

(3) When drug therapy is not effective, surgical intervention is indicated. There are many different procedures used, but the objective of all is to decrease intraocular pressure by facilitating the filtration and drainage of the aqueous fluid.

1-19. CONJUNCTIVITIS

Conjunctivitis is the inflammation of the conjunctiva. It is also referred to as "pink eye."

a. Causes of conjunctivitis include:

(1) Allergies.

(2) Physical trauma.

(3) Chemical irritation.

(4) Bacterial or viral infection.

b. Signs and symptoms include:

(1) Redness.

(2) Lacrimation (tearing).

(3) Swelling.

(4) Discharge.

(5) Pain.

c. Nursing management includes:

(1) Normal saline irrigations to flush out drainage.

(2) Warm compresses (15 minutes, 3-4 times per day).

(3) Administration of prescribed therapeutic medications.

(4) Patient education to avoid further irritation or spread of infection.

1-20. DETACHED RETINA

Detachment of the sensory retina from the pigment epithelium of the retina causes loss of clear vision. Tears, rips, or holes in the retina allow the vitreous humor to seep behind the retina, separating it from the epithelium. Unless the holes are sealed, the retina will progressively detach. There will be loss of central vision as well as peripheral vision.

a. Causes of detached retina include:

(1) Trauma (rapid detachment and visual deterioration).

(2) Aging (slow process of deteriorating vision).

b. Signs and symptoms of retinal detachment include:

(1) Flashes of light.

(2) Blurred vision.

(3) Sensations of "particles" or "lights" in the visual fields.

(4) Progressive loss of peripheral vision.

c. Nursing implications:

(1) Detachment of the retina must be corrected surgically. There are many different procedures used, but the objective of all is to seal the retinal holes, ensuring that the retina adheres to the retinal pigment epithelium.

(2) Nursing care should involve all aspects of care for the patient undergoing ophthalmic surgery. Refer to the following paragraphs for care of patients undergoing ophthalmic surgery.

1-21. PREOPERATIVE NURSING CARE OF THE PATIENT UNDERGOING OPHTHALMIC SURGERY

The eye is a delicate and important organ, and its care and protection are of the utmost importance. Common conditions of the eye that may require surgical intervention include trauma, cataract, glaucoma, and detached retina. The ophthalmologist will determine the treatment required and procedure of choice in each patient's case. The procedure may vary from a simple incision to facilitate drainage to total removal of the eyeball (enucleation).

a. **Physical Orientation.** The patient will require a thorough orientation to his immediate hospital environment. This is done to help the patient during the postoperative period, since he may be blind as a result of the procedure or the need for the eyes to be patched.

(1) Assist the patient to learn details of his room such as the location of furniture, doors, windows, and so forth.

(2) Familiarize the patient with the voices of those who will care for him after surgery. Familiarize him with the daily sounds and noises in the environment, since he will be more aware of sound without his vision.

b. **Observation.** The patient should be observed for tendencies to cough or sneeze (smoker's cough, allergies, and so forth). Such observations should be reported to the professional nurse for consideration in the plan of care. Such violent movements of the head during the postoperative course may cause increased intraocular pressure, leading to hemorrhage or rupture of incisions.

c. **Education.** The patient must receive a thorough education about the postoperative course of events and his responsibilities and restrictions. The patient must understand the objective of resting the eyes and avoiding actions that increase intraocular pressure.

(1) The head must be kept very still.

(2) No reading.

(3) No showers, no shampooing, no tub baths.

(4) No bending over at the waist.

(5) No lifting of heavy objects.

(6) No sleeping on the operative side. If both eyes are affected, the patient must sleep on his back.

d. **Physical Preparation.**

(1) A bowel prep is done the evening prior to surgery to prevent the patient from straining at stool during the immediate post-op period.

(2) Shaving of eyebrows, cutting of eyelashes, and shaving of face should be done only on the order of the surgeon.

(3) After the patient has been taken to surgery, prepare a post-op bed, ensuring that the bed is equipped with side rails.

(4) Sand bags should be made available for use in immobilizing the head.

e. **Family.** Often, if the patient must be kept absolutely still or will be temporarily blinded after surgery, a member of the family may be asked to stay with the patient. If this is the case, the family member should receive the same orientation and education given to the patient.

1-22. POSTOPERATIVE NURSING CARE OF THE PATIENT UNDERGOING OPHTHALMIC SURGERY

a. **Return from Surgery.**

(1) The patient must be lifted off the litter, he is not to move himself.

(2) The patient should be positioned in the bed as prescribed by the physician.

(3) Sandbags should be used to immobilize the patient's head, if ordered.

(4) If both eyes are bandaged (they normally are), the side rails MUST be raised at all times to protect the patient in the event he becomes disoriented and attempts to get out of bed.

(5) Place the call bell within easy reach of the patient's head and let the patient know exactly where it is located.

(6) Remind the patient that he should not cough, sneeze, or blow his nose. Instruct him to inform the staff if he feels the urge, since these actions will increase intraocular pressure.

b. **Orientation.**

(1) Reinforce the physical orientation given during the preoperative period by verbally reviewing the locations of objects in the room.

(2) Orient the patient to other people in the room.

(3) The patient should have an awareness of his surroundings and know what to expect to avoid being startled or frightened.

c. **Precautions.**

(1) Avoid dislodgement of the eye dressings by securing them with an eye shield or reinforcing loose tape.

(2) Restrain the arms of children and disoriented or uncooperative patients, as appropriate.

(3) A sleeping patient must be watched constantly to ensure that proper positioning is maintained. Often, a family member may be asked to stay with the patient for this purpose.

(4) Avoid jarring or bumping the bed, as this may startle the patient.

(5) If the patient is newly blinded as a result of the surgery, observe for depression and take precautions if patient is potentially suicidal.

(6) Check the physician's orders before giving anything by mouth. Nausea and vomiting must be avoided. Additionally, the motion of chewing may be contraindicated.

d. **Approaching the Patient.** An important consideration in the care of a patient who has both eyes bandaged is the method of approaching him.

(1) ALWAYS speak to the patient upon entering his area and before touching him.

(2) Allay the patient's fears by explaining each procedure or activity fully.

(3) Continue to reinforce his orientation to the surroundings.

(4) Always let the patient know when you are leaving his area.

e. **Diversional Activity.** Diversional activities will promote a relaxed atmosphere for convalescence and prevent the patient from dwelling on his situation.

(1) Provide activities that are not fatiguing to the eyes if the eyes are not bandaged.

(a) No reading.

(b) Minimal television.

(2) Encourage visitors to chat with the patient or read to him.

(3) Encourage the use of a radio for entertainment and to keep the patient "in touch" with current events if he is unable to read the daily newspaper.

1-23. NURSING CARE OF THE PATIENT WITH VISION LOSS

a. **Physical Orientation.** To prevent injury and encourage independence, the patient with vision loss should receive a thorough orientation to his surroundings.

(1) Describe the room and its contents in detail, so that the patient can form a mental image of his room.

(2) Lead the patient around the room, letting him feel the furniture, windows, and doorways.

(3) Orient the patient to any personnel that may be expected to enter his room. For example, housekeeping personnel or laboratory technicians.

(4) Familiarize the patient with the sounds of his environment. Explain the source of those he is unfamiliar with. Remember, a patient with vision loss depends heavily on his hearing for environmental cues and orientation.

(5) Orient the patient to things around him by comparing their location to the numbers on the face of a clock, with the patient located in the center of the clock.

(a) When describing his room, identify locations by clock reference. For example, the bathroom door is at 2 o'clock and the door to the hallway is at 9 o'clock.

(b) When describing the food on his plate, identify the location of the food items by clock reference. For example, the potatoes are at 12 o'clock, the green beans are at 3 o'clock, the roast beef is at 6 o'clock, and the biscuit is at 9 o'clock.

b. **Precautions.** To protect the patient from accidental injury, follow these guidelines.

(1) Inform the patient when something in his room has been moved or is different from usual.

(2) Keep doors completely opened or completely closed. This will prevent walking into a partially opened door.

(3) Keep toilet articles in the location the patient places them. Do not move them without telling the patient.

(4) Remove hazardous items such as light cords, small trash cans, and other items that the patient could trip over.

c. **Assisting the Patient.**

(1) Always address the patient by name when entering his area.

(2) Always let the patient know when you are leaving his area.

(3) When walking with the patient, do not hold him or walk behind him and push him along. Allow the patient to place his hand on your arm or shoulder and walk beside you.

(4) Encourage the patient to be independent and self-sufficient.

Section V. DISORDERS OF THE EAR

1-24. HEARING LOSS

a. **Conductive Hearing Loss.** Hearing loss due to an impairment of the external ear, middle ear or both.

b**. Perceptive Hearing Loss.** (Sensorineural hearing loss). Hearing loss due to disease of the inner ear or nerve pathways. Sensitivity to sound and discrimination of sound are both impaired.

c. **Mixed Hearing Loss.** Hearing loss due to a combination of conductive and perceptive loss.

d. **Psychogenic Hearing Loss.** Hearing loss with no physical basis. Usually a manifestation of an emotional disturbance.

1-25. IMPACTED CERUMEN (EARWAX)

a. Cerumen is a waxlike secretion found within the external auditory canal. Its presence is normal.

b. Cerumen does not need to be removed unless it is impacted or it interferes with hearing.

c. Impacted cerumen is removed by the physician (or a trained technician) using one of the following techniques:

(1) Irrigation.

(2) Instillation of drops designed to break down the cerumen.

(3) Removal with a blunt instrument such as a curet or loop.

1-26. FOREIGN BODY

a. Foreign bodies in the ear are most commonly seen in children, as children will frequently stick small objects into their ears. Other types of foreign bodies include:

(1) Insects (crawl or fly into the ear).

(2) Airborne matter (maybe blown into the ear).

NOTE: **NEVER** attempt to remove a foreign body from the ear unless you are skilled at the techniques used. The external ear canal could be damaged or the tympanic membrane ruptured. This procedure is normally performed by the physician.

b. Assist the physician to remove insects.

(1) Instill mineral oil drops to smother the insect.

(2) Turn the patient's head toward the affected side to facilitate the drainage of the oil with the insect.

(3) Use a blunt loop or forceps to remove the insect if it does not drain out.

c. Assist the physician to remove foreign bodies of non-vegetable matter:

(1) Irrigate the ear.

(2) Remove the object with a blunt instrument such as a curet or loop.

d. Assist the physician to remove foreign bodies of vegetable matter (peas, for example):

(1) Use a blunt instrument to remove the object.

(2) DO NOT irrigate the ear, as vegetable matter has a tendency to absorb water and swell. This will cause the object to become further impacted and more difficult to remove.

1-27. OTITIS MEDIA

a. Otitis media is inflammation of the middle ear, caused by entrance of pathogenic organisms. Pathogens may enter through:

(1) The eustachian tube.

(2) The external ear canal, through a perforated tympanic membrane.

b. Signs and symptoms include:

(1) Pain (earache, headache).

(2) Difficulty hearing.

(3) Fever.

(4) Anorexia.

(5) Nausea.

(6) Vomiting.

(7) Noises in the ear or head.

(8) Distended tympanic membrane.

(9) Closed eustachian tube (secondary to swelling).

c. Treatment.

(1) Local heat.

(2) Aspirin.

(3) Decongestants.

(4) Antibiotics.

(5) Myringotomy, if indicated.

d. Nursing Implications.

(1) The mucous membrane that lines the middle ear, eustachian tube, and pharynx is a continuous one. For this reason, infection may spread quickly and easily from one area to another. Nursing personnel should be alert for signs of spreading infection.

(2) Nursing personnel should be alert for signs that the tympanic membrane may rupture.

(a) Increased pain.

(b) Swollen tympanic membrane (bulging).

e. Myringotomy.

(1) A myringotomy is a small incision into the bottom of the tympanic membrane.

(2) Myringotomy is performed to:

(a) Relieve pressure.

(b) Allow drainage of pus or fluid.

(c) Prevent spontaneous rupture of the tympanic membrane.

(3) After a myringotomy, the tympanic membrane heals rapidly and hearing is not adversely affected.

1-28. CONCLUSION

a. This lesson has introduced the basic nursing care techniques and procedures involved in the nursing care related to the eyes and ears.

b. Review the lesson objectives once again. If you feel confident that you have achieved the lesson objectives, complete the exercises at the end of this lesson.

c. If you do not feel that you have met the lesson objectives, review the necessary material before you attempt the end of lesson exercises.

Continue with Exercises

EXERCISES, LESSON 1

INSTRUCTIONS: Answer the following exercises by completing the incomplete statement or by answering the question.

After you have completed all of these the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. The stimulus for sight is _____ .

2. The stimulus for equilibrium is _____ .

3. The receptor organ for hearing is the _____ of the ear.

4. The receptor organ for balance is the _____ of the _____ .

5. Airborne waves are converted to mechanical vibrations by the _____ and _____ .

6. When the pupil constricts as a result of light, the response is called a _____ .

7. Prior to instillation of medication or the application of dressings, the eyelids should be _____ .

8. Before instilling eye ointment, you must _____ to remove any crust.

9. Eyedrops and eye ointments are instilled into the _____ .

10. When irrigating a patient's eye, the head should be turned _____ .

11. After instilling eardrops, the patient should remain still with his head turned _____ .

12. When irrigating the ear, the temperature of the solution should be _____ .

13. The visual defect in which close objects can be seen more clearly than distant objects is called _____ .

14. A refractive error that results from weakening of the ciliary muscles is called _____ .

15. The condition known as "pink eye" is called _____ .

16. Patient's undergoing ophthalmic surgery should not cough or sneeze postoperatively because _____ .

17. When a patient returns from ophthalmic surgery, how should he be transferred from litter to bed? _____ .

18. Hearing loss due to disease of the inner ear or nerve pathways is called _____ .

19. Cerumen should be removed from the ear if it is _____ or _____ .

20. Why should irrigation not be used to remove a vegetable matter foreign body from the ear? _____ .

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 1

1. Light rays (para 1-1c(1)(b))
2. Gravitational forces (para 1-1c(5)(b))
3. Cochlea (para 1-1c(2)(a))
4. Membranous labyrinth; ear (para 1-1c(5)(a))
5. Tympanic membrane; ossicles (para 1-5b)
6. Direct reaction (para 1-7b(1))
7. Cleansed (para 1-12a)
8. Squeeze out a small amount onto sterile gauze (para 1-13i(3))
9. Conjunctival sac (para 1-13j(4))
10. Toward the affected side (paras 1-12b(4); 1-14d)
11. Toward the unaffected side (para 1-16e,k)
12. 95º-105ºF (para 1-17h)
13. Myopia or nearsightedness (para 1-18a)
14. Presbyopia (para 1-18c)
15. Conjunctivitis (para 1-19)
16. Such violent head movement may cause increased intraocular pressure (para 1-21b)
17. He must be lifted (para 1-22a(1))
18. Perceptive (or sensorineural) loss (para 1-24b)
19. Impacted; interferes with hearing (para 1-25b)
20. It will absorb water and swell (para 1-26d)

End of Lesson 1

LESSON ASSIGNMENT

LESSON 2 Nursing Care Related to the Neurological System.

TEXT ASSIGNMENT Paragraphs 2-1 through 2-45.

LESSON OBJECTIVES After completing this lesson, you should be able to:

2-1. Identify the parts of the central nervous system.

2-2. Identify the parts of the peripheral nervous system.

2-3. Identify the parts of the meninges.

2-4. State the functions of the cerebellum.

2-5. State the functions of the medulla.

2-6. Name the parts of the brainstem.

2-7. Identify the functions of the frontal lobe.

2-8. Identify the functions of the parietal lobes.

2-9. Identify the functions of the temporal lobes.

2-10. Identify the functions of the occipital lobe.

2-11. Define neuraxis.

2-12. Identify the parts of the spinal cord.

2-13. Identify the parts of a spinal nerve.

2-14. Define afferent nerve.

2-15. Define efferent nerve.

2-16. Identify the pathway of a reflex arc.

2-17. State the functions of the autonomic nervous system.

2-18. Describe five areas of concern to be evaluated when assessing mental status.

2-19. Evaluate level of consciousness.

2-20. Identify the purposes for lumbar puncture.

2-21. Identify the patient care needs of the unconscious patient.

2-22. Define the coup-contrecoup phenomenon.

2-23. Identify the signs and symptoms of infectious nervous system disorders.

2-24. Identify nursing care objectives for the care of patients with degenerative nervous system disorders.

2-25. Identify the signs and symptoms of increased intracranial pressure.

2-26. State the nursing care objectives for the care of a patient with increased intracranial pressure.

2-27. Identify the signs and symptoms exhibited by a patient with a spinal cord injury.

2-28. Identify risk factors associated with cerebral vascular accidents.

2-29. Identify the signs and symptoms of a stroke.

2-30. Identify the rehabilitation needs of a patient who has experienced a CVA.

2-31. Identify five types of seizure activity.

2-32. State the steps necessary to protect the patient during a seizure.

2-33. Identify the nursing care considerations for the patient who has had surgery for a brain tumor.

SUGGESTION

After studying the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 2

NURSING CARE RELATED TO THE NEUROLOGICAL SYSTEM

Section I. ANATOMY AND PHYSIOLOGY

2-1. INTRODUCTION

a. The nervous system can be thought of as having three major subdivisions:

(1) The central nervous system (CNS), which consists of the brain and spinal cord.

(2) The peripheral nervous system (PNS), which consists of those nerves which pass from the CNS to the periphery of the body (the cranial nerves and the spinal nerves).

(3) The autonomic nervous system (ANS), also referred to as the "involuntary" nervous system. Outside of the CNS and considered to be part of the PNS, the autonomic nervous system is sufficiently different in function to be studied as a separate division. Body functions that are not under conscious control are regulated by the ANS.

b. Neurological conditions are disorders that involve some portion of the nervous system. These conditions may result from infections, deranged physiology, or trauma. In all cases, the normal function of the nervous system has been altered, and the patient is not in control of the alterations.

2-2. THE CENTRAL NERVOUS SYSTEM

The CNS consists of the brain and the spinal cord, which share a continuous, protective, fibrous membrane cover called the meninges. The meninges consist of three separate membranes, which are separated by spaces.

a. **Dura Mater.**

(1) The dura mater is a tough fibrous layer that serves as the outer layer of meninges and the inner lining of the cranial bones.

(2) Between the dura mater and the next layer of meninges is a potential space called the subdural space.

b. **Arachnoid Mater.**

(1) The arachnoid mater is a fine, membranous layer of spider-web-like threads that extend from the dura mater, through the subarachnoid space, to the innermost layer of meninges.

(2) The subarachnoid space is filled with cerebrospinal fluid (CSF).

c. **Pia Mater.**

(1) The pia mater is the delicate, transparent membrane that directly covers the surface of the brain and spinal cord.

(2) The pia mater contains a network of blood vessels.

d. **Cerebrospinal Fluid**

(1) Cerebrospinal fluid, circulating within the network of the subarachnoid space, provides the brain and spinal cord with protection. It acts as a cushion, or shock-absorber, against injury.

(2) CSF is manufactured from blood in networks of capillaries called choroid plexuses. It circulates through the ventricles (cavities inside the brain) and subarachnoid space of the meninges.

2-3. THE BRAIN

The human brain has three major subdivisions--the brainstem, the cerebellum, and the cerebrum.

a. **The Brainstem.** The brainstem (figure 2-1) is the basal portion of the brain. It is continuous with the spinal cord. Exiting from the sides of the brainstem are 12 pairs of nerves known as the cranial nerves. The brainstem is divided into 3 major portions.

(1) Forebrainstem (diencephalon), consisting of:

(a) Thalamus--a sensory relay station for impulses conveyed upward from the spinal cord.

(b) Hypothalamus--concerned with regulation of autonomic functions.

(2) Midbrainstem (mesencephalon) consisting of:

(a) Corpora quadrigemina--concerned with vision and hearing.

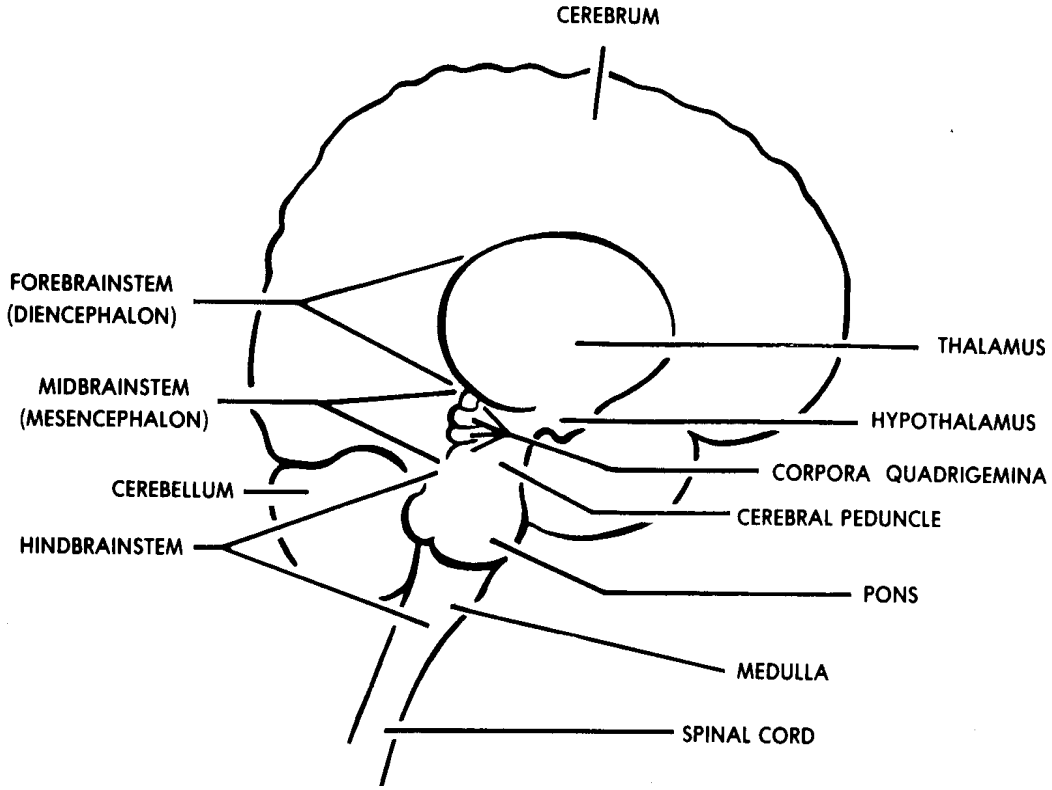


Figure 2-1. The brainstem.

(b) Cerebral peduncles--connecting the brainstem to the cerebrum.

(3) Hindbrainstem, consisting of:

(a) Pons--concerned with transmission of impulses between the left and right hemispheres of the cerebellum.

(b) Medulla--contains nerve centers for cardiac, vasomotor, and respiratory functions. Also influences sneezing, coughing, hiccoughing, and vomiting.

b. **The Cerebellum**. The cerebellum (figure 2-2) is a spherical mass of nervous tissue attached to and covering the hindbrainstem. It is attached to the brainstem by three pairs of cerebellar peduncles. The cerebellum consists of three lobes; the right hemisphere, left hemisphere, and a central portion called the vermis.

(1) The outer layer, or cortex, of the cerebellum is composed of "gray matter." Gray matter is actually the cell bodies of neurons. Many folds (gyri) and grooves (sulci) in the surface of the cortex give it a wrinkled appearance.

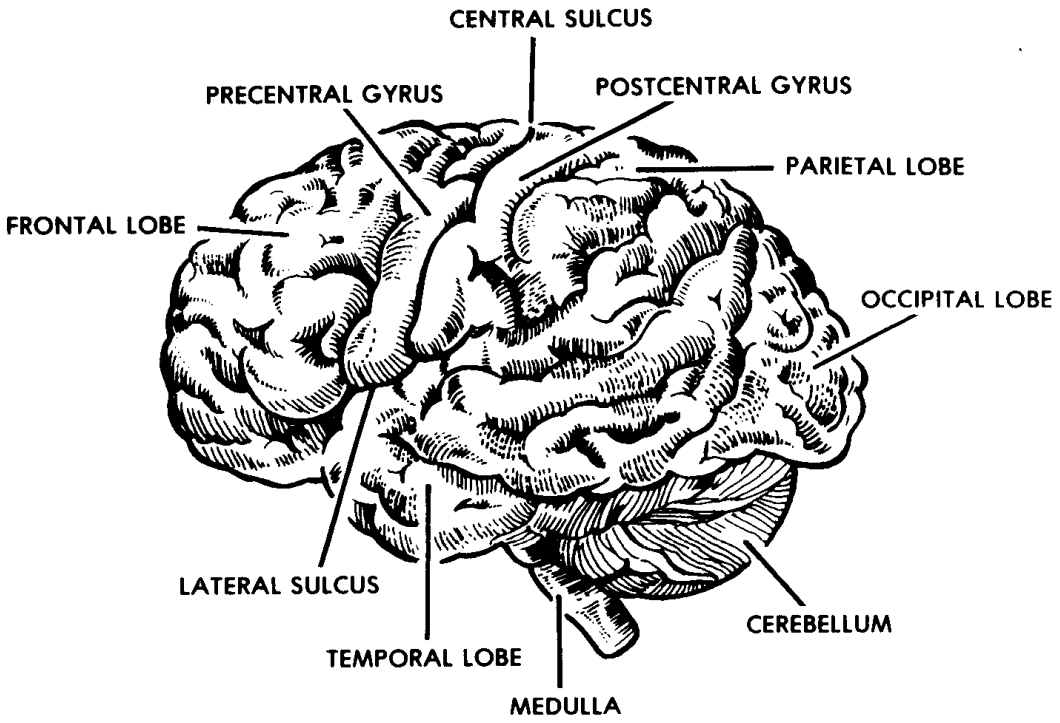


Figure 2-2. Human brain, lateral view.

(2) More centrally located within the cerebellum is the "white matter." White matter is actually the myelin covered processes of the neurons.

(3) The cerebellum is concerned with coordination of nerve impulses to the voluntary muscles and with the equilibrium of the body.

c. **The Cerebrum**. The cerebrum (figure 2-2) is the largest part of the brain. The outer layer of the cerebrum is called the cerebral cortex. It is composed of the cell bodies of neurons and is often referred to as the "gray matter." Many folds (gyri) and grooves (sulci) increase the surface area of this layer. Beneath the cortex lies the "white matter," actually the myelin covered processes of the neurons. The cerebrum is divided into right and left hemispheres by a longitudinal fissure. A band of nerve fibers called the corpus callosum connects the hemispheres and provides for communication between them. Each cerebral hemisphere is further divided into lobes, which are named after the overlying cranial bones (frontal, parietal, temporal, and occipital).

(1) Frontal lobe.

(a) The frontal lobe is located beneath the frontal bones of the skull. It is divided from the parietal lobes by the central sulcus and from the temporal lobes by the lateral fissure.

(b) The functions of the frontal lobe include personality, behavior, intellectual functioning, creative thinking, morals, ethics, and level of consciousness.

(c) The precentral gyrus, within the frontal lobe and directly in front of the central sulcus, initiates and controls voluntary muscle movements (motor function). Impulses originating here travel along motor pathways through the spinal cord and stimulate skeletal muscles on the opposite side of the body. (This is important to remember when correlating clinical symptoms with associated cerebral damage.) The percentral gyrus also contains Broca's speech center, which is involved in the motor activities necessary for speech.

(2) Parietal lobes.

(a) The parietal lobes are located beneath the parietal bones of the skull. They are posterior to the central sulcus and superior to the lateral fissure.

(b) The functions of the parietal lobes include comprehension of written and spoken language, discrimination of fine touch, and stereogenesis. Sterogenesis is the ability to recognize, by touch alone, the size, shape, texture, and consistency of objects.

(c) The postcentral gyrus, within the parietal lobes and directly behind the central sulcus, controls and interprets sensations from the opposite side of the body. These sensations include pain, heat, cold, and pressure.

(3) Temporal lobes.

(a) The temporal lobes are located beneath the temporal bones of the skull and inferior to the lateral fissure.

(b) The functions of the temporal lobes include taste, smell, balance, and hearing. (The perception of sound as well as the interpretation of sound as words.)

(c) The area of the brain concerned with the comprehension of both written and spoken language (Wernicke's area) is located in both the parietal and temporal lobes.

(4) Occipital lobe.

(a) The occipital lobe is located beneath the occipital bone of the skull, at the posterior of the cerebrum behind the parietal lobes.

(b) The occipital lobe receives and interprets visual stimuli.

2-4. THE SPINAL CORD

a. The spinal cord, located within the vertebral canal of the spine, is continuous with the brainstem. (Together, the brain and spinal cord are referred to as the neuraxis.) The spinal cord extends from the foramen magnum of the skull to the level of the first lumbar vertebrae, at which point it tapers to fine threads of tissue.

b. The spinal cord has two enlargements along its length that are due to an increase in the mass of nervous tissue required to serve the limbs.

(1) The cervical enlargement is associated with the nerves of the upper extremities.

(2) The lumbosacral enlargement is associated with the nerves of the lower extremities.

c. The spinal cord is composed of a central mass of gray matter (cell bodies of neurons) surrounded by white matter (myelinated processes of the neurons). The areas of gray and white matter are referred to as columns.

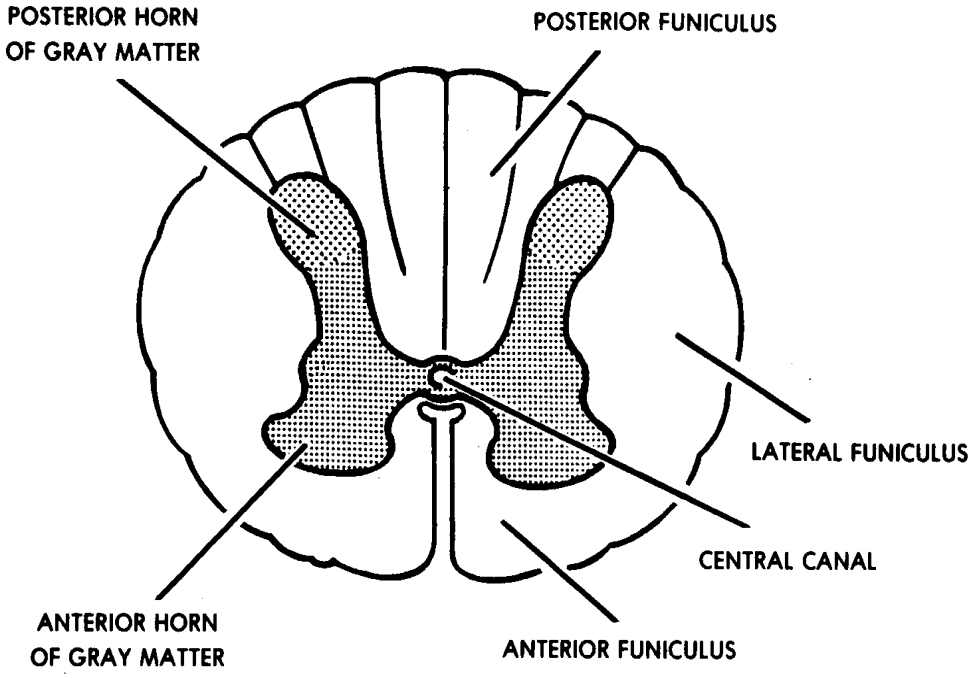


Figure 2-3. The spinal cord, cross-section.

d. In a cross-section of the spinal cord (figure 2-3), the gray matter appears to be H-shaped. Each arm of the H is called a horn, resulting in two anterior horns and two posterior horns. The connecting middle portion is called the gray commissure.

e. A very narrow canal, called the central canal, is located in the center of the spinal cord. This central canal is continuous with the fourth ventricle of the brain and contains CSF.

f. The processes of the neurons that compose the surrounding white matter are grouped into pathways called fiber tracts.

(1) Tracts conducting impulses from the brain are called motor tracts.

(2) Tracts conducting impulses to the brain are called sensory tracts.

(3) At some specific point along the neuraxis, these pathways cross to the opposite side of the cord and continue their path. (Each crossing is called a decussation.) Thus, the right cerebral hemisphere of the brain communicates with the left half of the body, and the left cerebral hemisphere communicates with the right half of the body.

g. Thirty-one pairs of spinal nerves exit from the spinal cord.

2-5. THE PERIPHERAL NERVOUS SYSTEM

a. Connecting the CNS to all parts of the body are nerves. A nerve is a collection of neuron processes, grouped together, and located outside of the CNS. (Neuron processes, grouped together, and inside the CNS are the fiber tracts of the spinal cord.) Nerves outside the CNS are referred to as peripheral nerves, or the PNS. These nerves connect the CNS to the periphery of the body.

b. The PNS is made up of a large number of nerves arranged in pairs. Each pair includes one nerve for the left side of the body and one nerve for the right side.

(1) Peripheral nerves connected to the brainstem are called cranial nerves. They are numbered from I through XII and have individual names.

(2) Peripheral nerves connected to the spine are called spinal nerves. They are identified by a letter, representing the corresponding region of the vertebral column, and a number representing the sequence within the region. For example, L-5 is the fifth spinal nerve in the lumbar region.

2-6. THE CRANIAL NERVES

a. **Olfactory Nerve (I).**

(1) Sensory nerve.

(2) Transmits smell impulses from receptors in the nasal mucosa to the brain.

b. **Optic Nerve (II).**

(1) Sensory nerve.

(2) Transmits visual impulses from the eye to the brain.

c. **Oculomotor Nerve (III).**

(1) Motor nerve.

(2) Contracts the eyeball muscles.

d. **Trochlear Nerve (IV).**

(1) Motor nerve.

(2) Contracts the eyeball muscles.

e. **Trigeminal Nerve (V).**

(1) Mixed nerve.

(2) Transmits pain, touch, and temperature impulses from the face and head to the brain (sensory function).

(3) Contracts the muscles of chewing (motor function).

f. **Abducens Nerve (VI).**

(1) Motor nerve.

(2) Contracts eyeball muscles.

g. **Facial Nerve (VII).**

(1) Mixed nerve.

(2) Transmits taste impulses from the tongue to the brain (sensory function).

(3) Contracts the muscles of facial expression and stimulates secretion of salivary and lacrimal glands (motor function).

h. **Vestibulocochlear Nerve (VIII).**

(1) Sensory nerve.

(2) Transmits hearing and balance impulses from the inner ear to the brain.

i. **Glossopharyngeal Nerve (IX).**

(1) Mixed nerve.

(2) Transmits taste impulses and general sensations from the tongue and pharynx (sensory function) to the brain.

(3) Contracts the swallowing muscles in the pharynx and stimulates secretions of the salivary glands.

j. **Vagus Nerve (X).**

(1) Mixed nerve.

(2) Transmits sensory impulses from the viscera (heart, smooth muscles, abdominal organs), pharynx, and larynx to the brain.

(3) Secrets digestive juices, contracts the swallowing muscles of the pharynx and larynx, slows down the heart rate, and modifies muscular contraction of smooth muscles.

k. **Spinal Accessory Nerve (XI).**

(1) Mixed nerve.

(2) Transmits sensory impulses from the pharynx and larynx to the brain.

(3) Contracts the muscles of the pharynx, larynx, and the neck.

l. **Hypoglossal Nerve (XII).**

(1) Motor nerve.

(2) Contracts the muscles of the tongue.

2-7. THE SPINAL NERVES

a. There are 31 pairs of spinal nerves, identified as follows:

(1) Cervical nerves (8) (C-1 through C-8).

(2) Thoracic nerves (12) (T-1 through T-12).

(3) Lumbar nerves (5) (L-1 through L-5).

(4) Sacral nerves (5) (S-1 through S-5).

(5) Coccygeal nerve (1).

b. In the human body, every spinal nerve has essentially the same structure and components. By learning the anatomy of one spinal nerve, you can understand the anatomy of all spinal nerves. Like a tree, a typical spinal nerve has roots, a trunk, and branches (rami) (figure 2-4).

(1) Coming off of the posterior and anterior sides of the spinal cord are the posterior (sensory) and anterior (motor) roots of the spinal nerve. An enlargement on the posterior root is the posterior root ganglion. (A ganglion is a collection of neuron cell bodies, together, outside the CNS.)

(2) Laterally, the posterior and anterior roots of the spinal nerve join to form the spinal nerve trunk. The spinal nerve trunk of each spinal nerve is located in the appropriate intervertebral foramen of the vertebral column. (An intervertebral foramen is a passage found on both sides of a vertebrae. It is formed by the columnar alignment of the vertebrae.)

(3) Where the spinal nerve trunk emerges laterally from the intervertebral foramen, the trunk divides into two major branches. These branches are called the anterior (ventral) and posterior (dorsal) primary rami (ramus, singular). The posterior primary rami go to the back. The anterior primary rami go the sides and front of the body and also to the upper and lower extremities.

c. A nerve has been defined as a collection of neuron processes. These processes may belong to different types of neurons--afferent (sensory), efferent (motor), or the visceral motor neurons of the autonomic nervous system. (The ANS will be discussed separately.)

(1) An afferent neuron carries sensory information from the periphery to the CNS.

(2) An efferent neuron carries motor commands from the CNS to the periphery of the body.

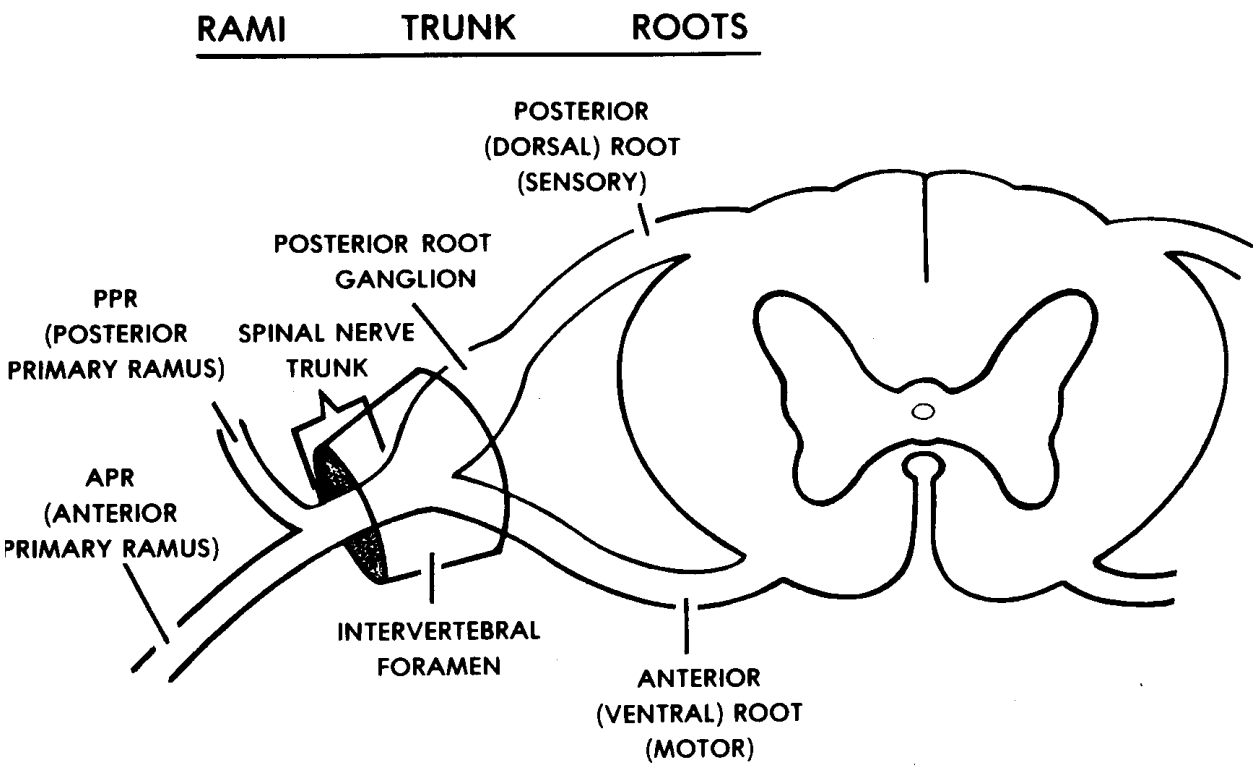


Figure 2-4. Spinal nerve.

2-8. NERVE ACTION

a. A stimulus acts upon a sensory receptor. The information is carried by an afferent (sensory) neuron through the merging branches of the spinal nerve that has been affected. The information is carried through the posterior root ganglion and posterior root to the spinal cord. Once the information reaches the spinal cord, it ascends the appropriate fiber tract to the designated area of the brain.

b. Motor information (commands) from the brain will descend along the appropriate fiber tract within the spinal cord until the appropriate spinal nerve is innervated. The efferent (motor) neurons carry the command from the spinal cord to the effector organ.

2-9. REFLEX ARC

The simplest reaction of the human nervous system is the reflex. A reflex is an automatic reaction to a stimulus. The pathway from the receptor organ to the reacting muscle is called a reflex arc (figure 2-5). The pathway of a reflex arc contains five components.

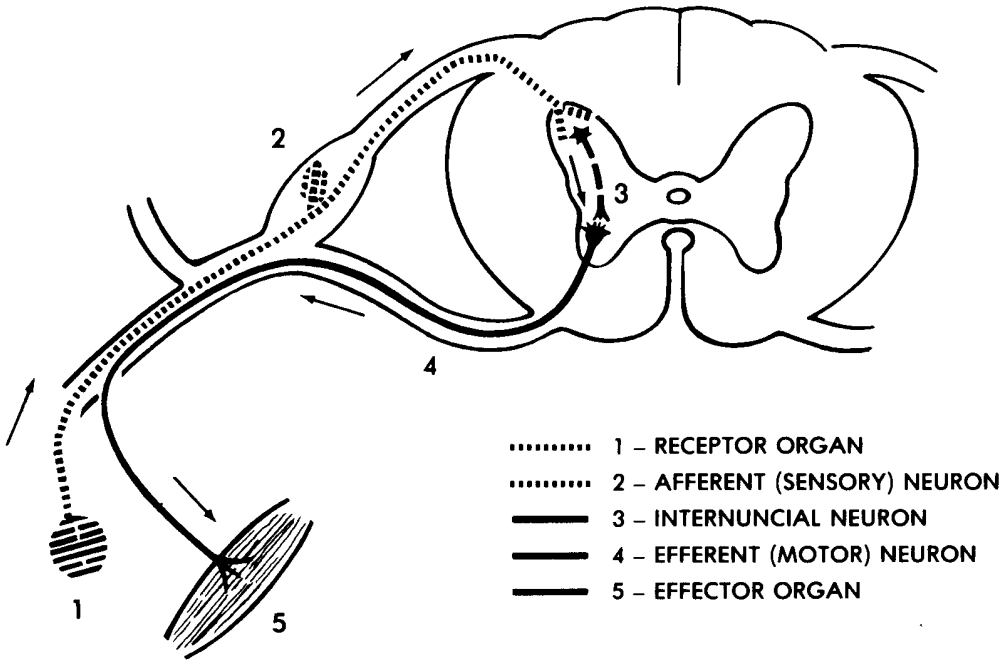


Figure 2-5. Reflex arc.

a. The stimulus is received by a receptor organ specific to that stimulus.

b. The information is transmitted to the CNS by the afferent neuron of the appropriate peripheral nerve.

c. Within the spinal cord, the afferent neuron synapses with a special connecting neuron called the internuncial neuron (or interneuron).

d. In turn, the internuncial neuron synapses with the efferent neuron's cell body. The axon of the efferent neuron carries the information to the effector organ.

e. The effector organ receives the command to act.

2-10. THE AUTONOMIC NERVOUS SYSTEM

a. The ANS is the portion of the nervous system concerned with innervation of smooth muscle, cardiac muscle and the glands. The ANS regulates visceral activities such as:

(1) Respiration.

(2) Gastrointestinal motility.

(3) Glandular secretion.

(4) Contraction of smooth muscles.

(5) Constriction and dilation of the pupils.

(6) Constriction and dilation of the blood vessels.

(2) Rate and force of cardiac muscle contraction.

b. It has always been thought that autonomic control is an "automatic" function and not of conscious control. However, recent research indicates that conscious control is possible with proper training. A classic example is the control of headache and hypertension by utilizing biofeedback techniques.

c. In the autonomic nervous system, there are two neurons, one following the other, that connect the CNS with the viscera of the body.

(1) The first neuron extends from the CNS to a ganglion, and is therefore called the preganglionic neuron. The cell body of the second neuron is located within this ganglion.

(2) The processes of the second neuron extend from the ganglion to the viscera. The second neuron is called the postganglionic neuron.

d. The ANS is organized into two major divisions:

(1) The sympathetic nervous system, also called the thoraco-lumbar outflow because the associated neurons originate in the thoracic and lumbar regions of the spinal cord.

(2) The parasympathetic nervous system, also called the cranio-sacral outflow because the associated neurons originate in the brainstem and the sacral region of the spinal cord.

e. Under ordinary circumstances, the sympathetic and parasympathetic nervous systems have opposite effects on bodily activities. That is, one system will stimulate action and the other will inhibit action. The interplay maintains bodily function in a state of equilibrium known as homeostasis.

f. The "fight or flight" response is produced by the sympathetic nervous system when conditions of stress or threat prevail.

(1) The sympathetic nervous system activates energy producing structures and helps the body expend effort and energy wisely.

(a) Heart rate increases.

(b) Pupils dilate.

(c) Gastric motility decreases.

(d) Urinary and anal sphincters close

(e) Blood sugar level rises.

(f) Adrenalin (epinephrine) is released by the adrenal medulla.

(2) Later, when the stress or threat has been eliminated, equilibrium is restored by the parasympathetic nervous system.

Section II. NEUROLOGICAL ASSESSMENT

2-11. INTRODUCTION

A thorough neurological assessment is one that accurately and completely evaluates the patient's vital signs, mental status, sensory function, motor function, and level of consciousness.

2-12. VITAL SIGNS

a. Vital signs should include:

(1) Blood pressure.

(2) Apical heart rate and rhythm.

(3) Radial pulses, bilaterally.

(4) Femoral pulses, bilaterally.

(5) Respiratory rate and rhythm.

(6) Temperature.

b. Vital signs should be evaluated as follows:

(1) Compare current vital signs with baseline and previous vital signs.

(2) Note any changes in pulse rate or rhythm.

(3) Note respiratory changes.

(4) Note temperature elevations.

(5) Note elevation of blood pressure, especially when it occurs with a widening pulse pressure.

2-13. MENTAL STATUS

a. Mental status assessment should evaluate the following areas:

(1) State of consciousness.

(2) Orientation.

(3) Affect. (Mood)

(4) Memory.

(5) Cognition.

b. The terms used to describe state of consciousness are often subjective and ambiguous. For this reason, such terms should not be used in nursing documentation unless they are qualified with an explanatory statement. When assessing a patient who is other than "awake and alert," it is best to use a standardized assessment scale. One such scale is the Glasgow Coma Scale (GCS), described in paragraph 2-16. Terms used to describe state of consciousness include:

(1) Conscious (alert)--the patient responds immediately, fully, and appropriately to visual, auditory, and other stimuli.

(2) Somnolent--unnatural drowsiness. The patient can be aroused and will respond to commands, but will fall asleep again as soon as he is left alone.

(3) Stuporous--partial unconsciousness. The patient can be aroused with painful stimuli and will attempt to respond with purposeful withdrawal from the stimulus. The patient may be restless or combative as well.

(4) Comatose--complete unconsciousness, no purposeful response to any stimulus.

c. Orientation is determined by questioning the patient about person, place, and time.

(1) Ask the patient to spell his name, name his children, or recite his address. Does the patient know who he is? Does the patient know who others are?

(2) Ask the patient to tell you where he is. He may be asked to name the hospital, city, state, and so on.

(3) Ask the patient to tell you the year, month, and time-of-day (mid-morning, late afternoon, and so forth). Do not ask for the date. This is a poor indication of orientation. Most people cannot tell you the exact date when questioned.

d. Affect, or mood, is evaluated by observing the patient's verbal and nonverbal behavioral responses for appropriateness. For example:

(1) Does the patient laugh when talking about serious or sad subjects?

(2) Is the patient easily startled by loud noises?

(3) Does the patient respond to stimuli in a normal manner?

(4) Does the patient display excessive anger, fear, confusion, and so forth?

e. Long and short term memory should be evaluated by asking questions.

(1) Discussing past events or questioning the patient about his medical history will test his ability for remote recall (long-term memory).

(2) Questions about daily events will test recent recall (short- term memory). For example, ask the patient what he ate for breakfast that morning.

f. Cognition is tested by asking the patient to perform calculations. For example, ask the patient to count backward from 100 by 7s.

2-14. SENSORY FUNCTION

a. Sensory function is evaluated by testing perception of pain, touch, and position.

(1) Pain--using a safety pin, touch the skin as lightly as possible to elicit a sharp sensation.

(2) Touch--ask the patient to close his eyes. Use a piece of cotton or gauze to gently brush the skin on the patient's arms, legs, and feet. Ask the patient to tell you when and where he feels a touch.

(3) Position--ask the patient to close his eyes. Grasp one of the patient's digits (thumb, great toe) and move it up or down. Ask the patient to tell you which direction the digit is pointing. Do not exert any pressure with your grasp that will indicate which direction you are moving the digit.

b. Pupillary response is another sensory function indicator. Evaluate:

(1) Size in millimeters (do not use subjective terms such as dilated or pinpoint.)

(2) Equality in size of the pupils.

(3) Response to light.

2-15. MOTOR FUNCTION

Evaluate motor function by testing muscle strength, mobility, and coordination.

a. Position the patient comfortably so that you can observe both upper and lower extremities.

b. Beginning with upper extremities, ask patient to put each joint (wrist, elbows, shoulders) through active range of motion.

(1) Observe smoothness of movement.

(2) Note inability to move any body part.

(3) Observe patient's facial expression for signs of any pain/discomfort.

c. Extend your index and middle fingers of each hand and ask patient to grip firmly.

(1) Dominant hand will usually be slightly stronger.

(2) Note strength of both hands and compare strength of one to the other.

d. Instruct patient to put each lower extremity joint (ankles, knees, hips) through active range of motion.

(1) Observe smoothness of movement.

(2) Note inability to move any body part.

(3) Observe patient's facial expression for signs of any pain/ discomfort.

e. Ask the patient to alternately flex and extend his feet while you provide resistance with your hands.

(1) Note the strength that the patient exerts against your resistance and compare right to left.

(2) If muscle group is weak, lessen your resistance or provide no resistance to permit more accurate observation.

f. Observe coordination.

(1) Ask the patient to run his left heel along his right shin (while standing) and vice versa.

(2) Ask the patient to close his eyes, extend his arms, and touch his index finger to his nose.

(3) Ask the patient to walk in a straight line, forward and backward. Observe posture and balance.

2-16. LEVEL OF CONSCIOUSNESS

a. The Glasgow Coma Scale (GCS) is a standardized, objective, reliable instrument for the assessment of level of consciousness.

b. The scale measures three areas of observable behavioral responses (verbal, motor, and eye). Patient responses are graded by the degree of dysfunction. The patient's best response in each of the three areas is recorded. The combined score of the three areas is the "consciousness level" score.

c. Recording and/or graphing the scores on a flow sheet permits easy tracking of the patient's status.

d. Response scale. (Explanation)

(1) Eye response.

(a) 4 points--eyes open spontaneously.

(b) 3 points--eyes open in response to sound.

(c) 2 points--eyes open in response to painful stimuli.

(d) 1 point--eyes do not open in response to any stimuli.

(2) Verbal response.

(a) 5 points--the patient is oriented to person, place, and time.

(b) 4 points--the patient is confused but is able to communicate.

(c) 3 points--the patient speaks in a disorganized manner. (Inappropriate speech.)

(d) 2 points--the patient's response is moaning or groaning sounds. (Incomprehensible sounds.)

(e) 1 point--the patient does not respond.

(3) Motor response.

(a) 6 points--the patient obeys commands appropriately and moves all extremities equally and spontaneously.

(b) 5 points--the patient "localizes" to the stimulus (pain). Attempts to locate the source of the pain and move the limb away from the stimulus.

(c) 4 points--the patient attempts to withdraw from the source of the (painful) stimuli in a less than purposeful movement. (Flexor withdrawal.)

(d) 3 points--the patient flexes an extremity abnormally. (Decorticate response.)

(e) 2 points--the patient extends an extremity abnormally. (Decerebrate response.)

(f) 1 point--the patient has no motor response. (Flaccid.)

e. Abbreviated Response Scale.

Eye Opening	
Spontaneous	= 4
To sound	= 3
To pain	= 2
None	= 1
Best Verbal Response	
Oriented	= 5
Confused	= 4
Inappropriate words	= 3
Incomprehensible sounds	= 2
None	= 1
Best Motor Response	
Obeys commands	= 6
Localizes stimulus	= 5
Withdrawal from stimulus	= 4
Abnormal flexion (decorticate)	= 3
Abnormal extension (decerebrate)	= 2
Flaccid	= 1
TOTAL SCORE POSSIBLE	= 3 through 15

Section III. DIAGNOSTIC PROCEDURES

2-17. SKULL X-RAYS

a. Skull X-rays are the oldest, non-invasive neurological test used to evaluate the bones, which make up the skull. Because of complex anatomy of the skull, a series of films is usually required for a complete evaluation.

b. Diagnostic uses for skull X-rays:

(1) To detect fractures in patient's with head trauma.

(2) To help detect and assess increased intracranial pressure, tumors, bleeding, and infection.

(3) To aid diagnosis of pituitary tumors.

(4) To detect congenital anomalies.

c. Nursing implications.

(1) Review the patient's clinical record to determine the reason (purpose) for the specific scheduled skull x-rays.

(2) Approach and identify the patient.

(3) Interview the patient to determine his/her knowledge of the purpose of the skull x-rays.

(4) As indicated, explain to the patient the specific purpose of the skull x-rays in his/her situation. Explain purpose in a manner consistent with that offered by the physician to avoid confusing the patient.

(5) Explain to the patient the events which will occur prior to the skull x-rays.

(a) Patient is not required to restrict food and fluids before x-rays.

(b) All jewelry and other metal objects must be removed from patient's head and neck and placed in safekeeping.

(c) Tell the patient where and when the x-rays will be performed.

(6) Explain to the patient events which will occur during the skull x-ray procedure.

(a) Patient will be placed in a supine position on a radiographic table, or seated in a chair, and instructed to remain still.

(b) A headband, foam pads, or sandbags may be used to immobilize the patient's head and increase patient comfort.

(c) Tell the patient that several (usually five) x-ray films of the skull will be taken from various angles.

(d) Reassure patient that the procedure will cause no discomfort.

(e) Films will be developed and checked before patient leaves the x-ray department.

(7) Explain to the patient events, which will occur after the procedure.

(a) Patient will be returned to his/her room.

(b) Physician will report the results of the x-rays to the patient when they are available.

2-18. LUMBAR PUNCTURE

a. Lumbar puncture is the insertion of a sterile needle into the subarachnoid space of the spinal canal, usually between the third and fourth vertebra, to reach the cerebral spinal fluid. This test requires sterile technique and careful patient positioning. It is performed therapeutically to administer drugs or anesthetics and to relieve intracranial pressure.

b. Diagnostic uses for lumbar puncture:

(1) To determine the pressure of the cerebral spinal fluid.

(2) To detect increased intracranial pressure.

(3) To detect presence of blood in the cerebral spinal fluid which indicates cerebral hemorrhage.

(4) To obtain cerebral spinal fluid specimens for laboratory analysis.

c. Nursing implications.

(1) Review the patient's clinical record to determine the reason for the patient's scheduled lumbar puncture procedure and what the patient has been told about the procedure.

(2) Assemble the necessary equipment.

(a) Sterile disposable lumbar tray.

(b) Overbed table.

(c) Sterile gloves.

(d) Betaine solution.

(e) Local anesthetic.

(f) Labels.

(g) Laboratory request slips.

(3) Approach and identify the patient.

(4) Interview the patient to determine his/her knowledge of the purpose of the lumbar puncture procedure.

(5) As indicated, explain to the patient the specific purpose of the lumbar puncture procedure. Explain purpose in a manner consistent with that offered by the physician to avoid confusing the patient.

(6) Explain the procedure to the patient.

d. Procedure.

(1) Ask the patient to empty his/her bladder.

(2) Position the patient.

(a) Lateral recumbent, at the edge of the bed, knees drawn up to abdomen, and chin tucked to chest.

(b) To help the patient maintain this position, the nursing paraprofessional places one hand behind the patient's neck and the other behind patient's knees to help support the patient's position throughout the procedure.

(3) The physician will clean the puncture site area with sterile applicators from the lumbar puncture tray.

(4) The physician will drape the area with a fenestrated drape to provide a sterile field.

(5) The physician will inject local anesthetic into the planned needle puncture site.

(6) The physician will insert the spinal needle. The patient will feel some pressure at this time.

(7) If the procedure is being performed to administer contrast media for radiologic studies or spinal anesthetic, the physician will inject the dye or anesthetic.

(8) When the needle is in place, the physician will attach a manometer with stopcock to the needle hub to read CSF pressure. (The patient may need to extend his legs to provide a more accurate pressure reading.)

(9) The physician will detach the manometer and allow the fluid to drain from the needle hub into four collection tubes.

(10) When there is approximately 2 or 3 ml of fluid in each tube, the physician will hand them to the assistant, who will mark the tubes in sequence, stopper them securely, and label them properly, as such:

(a) Gram stain.

(b) Culture, sensitivity.

(c) Cell count.

(c) Protein and glucose.

(11) The physician will remove the spinal needle, apply pressure to the area briefly, and apply a band-aid or small dressing.

(12) The entire procedure will last approximately 15 minutes.

e. Follow-up.

(1) Send the CSF specimens to the laboratory immediately.

(2) Instruct the patient to lie flat for several hours to reduce chance of headache.

(3) Monitor the patient carefully following the procedure. Adverse reactions including headache, vertigo, syncope, nausea, tinnitus, respiratory distress, change in vital signs, meningitis, and fever should be reported to the professional nurse.

(4) Give the patient increased fluids for at least 24 hours after the procedure.

(5) Inform the patient that the physician will report the results of the lumbar puncture as soon as they are available.

(6) Ensure the comfort and safety of the patient.

(7) Remove equipment from bedside and dispose of properly.

(8) Record the procedure in the patient's chart.

2-19. ELECTROENCEPHALOGRAM

a. An electroencephalogram (EEG) is a recording of brain wave activity.

(1) Electrodes are attached to specific areas of a patient's scalp.

(2) Electrical impulses are received and transmitted to a machine called an electroencephalograph, which magnifies the impulses and records them on moving strips of paper. (Much the same as an electrocardiogram.)

b. Diagnostic uses for EEG.

(1) To determine the presence and type of epilepsy.

(2) Aid in diagnosis of intracranial lesions.

(3) To evaluate the brain's electrical activity in metabolic disease, head injury, meningitis, and encephalitis.

(4) To confirm brain death.

c. Nursing implications.

(1) Review the patient's clinical record to determine the reason for the patient's scheduled electroencephalography and what the patient has been told about the procedure.

(2) Check the patient's medication history for drugs that may interfere with test results, and report positive findings to charge nurse.

(a) Anticonvulsants.

(b) Tranquilizers.

(c) Barbiturates.

(d) Other sedatives.

(3) Approach and identify the patient.

(4) Interview the patient to determine his/her knowledge of the purpose of the electroencephalogram procedure.

(5) As indicated, explain to the patient the specific purpose of the electroencephalogram.

(6) Explain to the patient events which will occur prior to the electroencephalogram.

(a) Food or fluids need not be restricted.

(b) Tell the patient when and where the test will be performed, and who will do it.

(c) Patient will be transported to electroencephalogram clinic.

(7) Explain to the patient events that will occur during the procedure.

(a) Patient will be asked to relax in a reclining chair or lie on a bed, and electrodes will be attached to the scalp.

(b) Assure the patient that the electrodes will not cause electrical shocks.

(c) If needle electrodes are used, the patient will feel pricking sensations when they are inserted.

(d) Before the recording procedure starts, the patient is instructed to relax with the eyes closed and remain still.

(8) Explain to the patient events which will occur after the electroencephalogram procedure.

(a) Patient will return to his/her room.

(b) Physician will report the results of the electroencephalogram to the patient when they are available.

2-20. BRAIN SCAN

a. Brain scanning is the use of a specialized camera to provide images of the brain after an I.V. injection of a radionucleotide. Normally, the radionucleotide cannot permeate the blood-brain barriers, but if pathologic changes have destroyed the barrier, the radionucleotide may concentrate in the abnormal area.

b. Diagnostic uses:

(1) To detect an intracranial mass or vascular lesion.

(2) To locate areas of ischemia, cerebral infarction, or hemorrhage.

(3) To evaluate the course of certain lesions postoperatively and during chemotherapy.

c. Nursing implications.

(1) Review the patient's clinical record to determine the reason (purpose) for the specific patient's scheduled brain scanning procedure and what the patient has been told about the procedure.

(2) Approach and identify the patient.

(3) Interview the patient to determine his/her knowledge of the purpose of the brain scanning procedure.

(4) As indicated, explain to the patient the specific purpose of the brain scan. Explain purpose in a manner consistent with that offered by the physician to avoid confusing the patient.

(5) Explain to the patient events that will occur prior to the brain scanning procedure.

(a) Patient will not have to restrict food or fluids before test.

(b) Patient will be asked to empty his/her bladder prior to the procedure.

(c) All jewelry or metal in the x-ray field will be removed and placed in safe keeping.

(d) Describe the scanning machine and explain it will move back and forth close to the patient's head.

(e) Explain that the procedure is painless and that the radiation poses no danger to the patient or visitors.

(f) A radioactive drug will be injected intravenously at least one hour before the scan begins.

(6) Explain to the patient events that will occur during the brain scanning procedure.

(a) The patient will be transported to the nuclear medicine department.

(b) Films will be taken of the brain at various time intervals.

(c) The patient can expect to be in the nuclear medicine department at least an hour and a half.

(7) Explain to the patient events that will occur after the brain scan.

(a) Patient will be transported back to his/her room.

(b) Physician will report the results of the brain scan to the patient when available.

2-21. CEREBRAL ANGIOGRAPHY

a. A cerebral angiogram is a radiographic examination of the cerebral vasculature after injection of a contrast medium. Common injection sites are the carotid, brachial, and femoral arteries.

b. Diagnostic uses for cerebral angiography.

(1) To detect cerebrovascular abnormalities.

(2) To study vascular displacement caused by tumor, hematoma, edema, arterial spasm, or increased intracranial pressure.

(3) To locate surgical clips applied to blood vessels during surgery and to evaluate the postoperative status of the vessels.

c. Nursing implications.

(1) Review the patient's clinical record to determine the reason (purpose) for the specific patient's scheduled cerebral angiography and what the patient has been told about the procedure.

(2) Check the patient's medication history for hypersensitivity to iodine, seafoods, or the dyes used for other local tests, and report significant findings to the Professional Nurse.

(3) Approach and identify the patient.

(4) Interview the patient to determine his/her knowledge of the purpose of the cerebral antiography procedure.

(5) As indicated, explain to the patient the specific purpose of the cerebral angiography in his/her situation. Explain purpose in a manner consistent with that offered by the physician to avoid confusing the patient.

(6) Explain to the patient events that will occur prior to the cerebral angiography procedure.

(a) Patient will be required to fast 8-10 hours before test.

(b) All jewelry, dentures, and hair pins will be removed and placed in safekeeping.

(c) Patient will wear a hospital gown.

(d) Patient will be asked to empty his/her bladder prior to the procedure.

(e) Patient (or responsible family member) must sign a consent form.

(f) The test will take approximately two hours.

(g) If ordered, medication such as a sedative may be administered prior to the test.

(7) Explain to the patient events that will occur during the cerebral angiography procedure.

(a) Patient will be transported to the x-ray department.

(b) The patient will be placed in a supine position on the x-ray table and asked to remain still.

(c) Contrast medium will be injected intravenously.

(d) The patient may experience a transient burning sensation at the injection site during the injection.

(e) The patient may become flushed, warm, or nauseated after injection of the contrast medium. A transient headache or salty taste in the mouth may also be experienced.

(8) Explain to the patient events, which will occur after the cerebral angiography.

(a) Patient will be returned to his/her room.

(b) Physician will report the results of the cerebral angiography test to the patient, when they are available.

(9) Document the completion of the examination and the patient's return to the nursing unit.

Section IV. CARE OF THE UNCONSCIOUS PATIENT

2-22. GENERAL

a. Unconsciousness means that the patient is unaware of what is going on around him and is unable to make purposeful movement. The basic principle to remember is that the unconscious patient is completely dependent on others for all of his needs. Any omissions in basic nursing care or any failure to protect the unconscious patient in his helpless state may inhibit recovery or greatly prolong his convalescence because of complications that might have been prevented.

b. The most common causes of prolonged unconsciousness include:

(1) Cerebrovascular accident (CVA).

(2) Head injury.

(3) Brain tumor.

(4) Drug overdose.

c. General nursing considerations:

(1) Always assume that the patient can hear, even though he makes no response.

(2) Always address the patient by name and tell him what you are going to do.

(3) Refrain from any conversation about the patient's condition while in the patient's presence.

d. Regularly observe and record the patient's vital signs and level of consciousness.

(1) Always take a rectal temperature.

(2) Report changes in vital signs to the professional nurse.

(3) Note changes in response to stimuli.

(4) Note the return of protective reflexes such as blinking the eyelids or swallowing saliva.

e. Keep the patient's room at a comfortable temperature. Check the patient's skin temperature by feeling the extremities for warmth or coolness. Adjust the room temperature if the patient's skin is too warm or too cool.

2-23. AIRWAY AND BREATHING

a. Maintain a patent airway by proper positioning of the patient. Whenever possible, position the patient on his side with the chin extended. This prevents the tongue from obstructing the airway.

(1) This lateral recumbent position is often referred to as the "coma position."

(2) It is the safest position for a patient who is left unattended.

b. Suction the mouth, pharynx, and trachea as often as necessary to prevent aspiration of secretions.

c. Reposition the patient from side-to-side to prevent pooling of mucous and secretions in the lungs.

d. Administer oxygen as ordered.

e. Always have suction available to prevent aspiration of vomitus.

2-24. NUTRITIONAL NEEDS

a. A patient who is unconscious is normally fed and medicated by gavage.

(1) Always observe the patient carefully when administering anything by gavage.

(2) Do not leave the patient unattended while gavage feeding.

(3) Keep accurate records of all intake. (Feeding formula, water, liquid medications.)

(4) When gavage feeding an unconscious patient, it is best to place the patient in a sitting position (Fowler's or semi-Fowlers) and support with pillows.

(a) This permits gravity to help move the feeding or medication.

(b) The chance of aspiration of feeding into the airway is reduced.

b. Fluids are maintained by IV therapy.

(1) Keep accurate records of IV intake and urine output.

(2) Observe the patient for signs of dehydration or fluid overload.

2-25. SKIN CARE

a. The unconscious patient should be given a complete bath every other day. (This prevents drying of the skin.) The patient's face and perineal area should be bathed daily.

(1) The skin should be lubricated with moisturizing lotion after bathing.

(2) The nails should be kept short, as many patients will scratch themselves.

b. Provide oral hygiene at least twice per shift. Include the tongue, all tooth surfaces, and all soft tissue areas. The unconscious patient is often a mouth breather. This causes saliva to dry and adhere to the mouth and tooth surfaces.

(1) Always have suction apparatus immediately available when giving mouth care to the unconscious patient.

(2) Apply petrolatum to the lips to prevent drying.

c. Keep the nostrils free of crusted secretions. Prevent drying with a light coat of lotion, petrolatum, or water-soluble lubricant.

d. Check the eyes frequently for signs of irritation or infection. Neglect can result in permanent damage to the cornea since the normal blink reflex and tear-washing mechanisms may be absent. Use only cleansing solutions and eye drops ordered by the physician. One such solution, methyl cellulose (referred to as "artificial tears") may be ordered for instillation at frequent intervals to prevent irritation.

e. If the patient is incontinent, the perineal area must be washed and dried thoroughly after each incident.

(1) Change the bed linen if damp or soiled.

(2) Observe the skin for evidence of skin breakdown.

f. Skin care should be provided each time the patient is turned.

(1) Examine the skin for areas of irritation or breakdown.

(2) Apply lotion, prn.

(3) Gently massage the skin to stimulate circulation.

2-26. ELIMINATION

a. The bowel should be evacuated regularly to prevent impaction of stool.

(1) Keep accurate record of bowel movements. Note time, amount, color, and consistency.

(2) A liquid stool softener may be ordered by the physician to prevent constipation or impaction. It is generally administered once per day.

(3) Assess for fecal impaction. The patient may be incontinent of stool, yet never completely evacuate the rectum. Small, frequent, loose stools may be the first signs of an impaction as the irritated bowel forces liquid stools around the retained feces.

(4) If enemas are ordered, use proper technique to ensure effective administration and effective return of feces and solution.

b. The bladder should be emptied regularly to prevent infection or stone formation.

(1) Adequate fluids should be given to prevent dehydration.

(2) Keep accurate intake and output records.

(3) Report low urine output to professional nurse.

(4) Provide catheter care at least once per shift to prevent infection in catheterized patients.

2-27. POSITIONING

a. When positioning the unconscious patient, pay particular attention to maintaining proper body alignment. The unconscious patient cannot tell you that he is uncomfortable or is experiencing pressure on a body part.

(1) Limbs must be supported in a position of function. Do not allow flaccid limbs to rest unsupported.

(2) When turning the patient, maintain alignment and do not allow the arms to be caught under the torso.

(3) Change the patient's position to a new weight-bearing surface every two hours. This decreases the likelihood of complications such as decubitus ulcers, orthostatic pneumonia, and thrombophlebitis.

(4) Utilize a foot board at the end of the bed to decrease the possibility of foot drop.

b. When joints are not exercised in their full range of motion each day, the muscles will gradually shrink, forming what is known as a contracture. Passive exercises must be provided for the unconscious patient to prevent contractures.

(1) Exercises with a range of motion (ROM) are performed under the direction of the physical therapist.

(2) Nursing personnel must be proficient in ROM exercises.

(a) Physical therapy personnel will not always be available.

(b) It is a nursing care responsibility to maintain the patient's range of motion.

c. Precautions must be taken to prevent the development of pressure sores.

(1) Utilize a protective mattress such as a flotation mattress, alternating pressure mattress, or eggcrate mattress.

(2) Change the patient's position at least every two hours.

(3) Unless contraindicated, get the patient out of bed and into a cushioned, supportive chair.

d. Protect the patient from injury.

(1) Keep siderails up.

(2) Pad the rails with pillows or folded blankets.

(3) Keep stray objects out of the bed.

(4) Use draw sheets for easier turning.

(5) Keep suction equipment available at the bedside for emergencies.

e. Restraints.

(1) Use restraints only with physician's order.

(2) Use "mitten" restraints to prevent the patient from pulling at catheters, IV lines, his hair, and so on. (Patients not in deep coma may scratch or pick at themselves.)

(3) The restless, confused patient will actively resist restraint and thrash about more when not permitted some freedom of movement of the arms and legs.

(4) Take precautions to prevent restraint from becoming restricting. Do not cut-off circulation. Do not irritate the skin.

Section V. INFECTIOUS NERVOUS SYSTEM DISORDERS

2-28. INTRODUCTION

Infectious neurological diseases usually render the patient acutely ill. Caring for a patient with an infectious neurological condition provides a challenge for the health care team in terms of bedside clinical skills and intensive planning for discharge and rehabilitation.

2-29. MENINGITIS

a. **Definition.** Meningitis is inflammation of the meninges. The severity of the disease is dependent upon the specific microorganism involved, the presence of other neurological disorders, the general health of the patient, the speed of diagnosis, and the initiation of treatment.

b. **Causes of Meningitis.**

(1) Travel of infectious microorganisms to the meninges via the bloodstream or through direct extension from an infected area (such as the middle ear or paranasal sinuses). Common microorganisms include:

(a) Meningococcus.

(b) Streptococcus.

(c) Staphylococcus.

(d) Pneumococcus.

(2) Contaminated head injury.

(3) Infected shunt.

(4) Contaminated lumbar puncture.

c. **Diagnostic Evaluation Techniques.**

(1) Lumbar puncture to identify the causative organism in the cerebrospinal fluid.

(2) Blood cultures.

(3) Physical examination.

d. **Signs and Symptoms.**

(1) Elevated temperature.

(2) Chills.

(3) Headache (often severe).

(4) Nausea, vomiting.

(5) Nuchal rigidity (stiffness of the neck).

(6) Photophobia.

(7) Opisthotonos (extreme hyperextension of the head and arching of the back due to irritation of the meninges).

(8) Altered level of consciousness.

(9) Multiple petechiae on the body.

e. **Nursing Management.**

(1) Administer intravenous fluids and medications, as ordered by the physician.

(a) Antibiotics should be started immediately.

(b) Corticostertoids may be used for the critically ill patient.

(c) Drug therapy may be continued after the acute phase of the illness is over to prevent recurrence.

(d) Record intake and output carefully and observe patient closely for signs of dehydration due to insensible fluid loss.

(2) Monitor patient's vital signs and neurological status and record.

(a) Level of consciousness. Utilize GCS for accuracy and consistency.

(b) Monitor rectal temperature at least every 4 hours and, if elevated, provide for cooling measures such as a cooling mattress, cooling sponge baths, and administration of ordered antipyretics.

(3) If isolation measures are required, inform family members and ensure staff compliance of isolation procedures in accordance with (IAW) standard operating procedures (SOP).

(4) Provide basic patient care needs.

(a) The patient's level of consciousness will dictate whether the patient requires only assistance with activities of daily living or total care. If patient is not fully conscious, follow the guidelines for care of the unconscious patient (Section IV).

(b) Maintain dim lighting in the patient's room to reduce photophobic discomfort.

(5) Provide discharge planning information to the patient and family.

(a) Follow up appointments with the physician.

(b) Discharge medication instruction.

(c) Possible follow-up with the community health nurse.

2-30. ENCEPHALITIS

a. **Definition.** Encephalitis is an infectious disease of the central nervous system characterized by pathological changes in the gray and white matter of the cord and brain. Pathophysiological changes associated with encephalitis include:

(1) Severe, diffuse inflammation of the brain.

(2) Intense lymphocytic infiltration, especially around cerebral blood vessels.

(3) Possible extensive nerve cell destruction.

b. **Causes of Encephalitis.**

(1) Microorganisms.

(2) Chemical toxins (lead, arsenic, carbon monoxide).

(3) As a complication of infectious childhood diseases (measles, rubella, chicken pox).

c. **Signs and Symptoms.** (Onset of symptoms is usually very sudden.)

(1) Fever.

(2) Severe headache.

(3) Nuchal rigidity.

(4) Vomiting.

(5) Altered level of consciousness, lethargy.

(6) Seizures.

(7) Incoordination, muscular weakness.

(8) Visual disturbances (photophobia, diplopia).

d. **Management.**

(1) Because no specific antiviral measure has yet been developed, medical treatment is symptomatic.

(2) Specific supportive nursing measures which apply to the patient with meningitis should be followed.

2-31. POLIOMYELITIS

a. **Definition.** Poliomyelitis is an acute, highly infectious viral disease characterized by fever, paralysis, and muscle atrophy. Infection is transmitted through oral and nasal secretions or through the oral-fecal route. The incidence of polio has been greatly reduced with childhood immunization using the Sabin and Salk polio vaccines.

b. **Signs and Symptoms.**

(1) Headache.

(2) Vomiting.

(3) Fever.

(4) Lethargy.

(5) Anorexia.

(6) Muscle pain, stiffness.

(7) Loss of deep tendon reflexes.

(8) Muscle weakness.

(9) Paralysis.

c. **Medical and Nursing Management.**

(1) Monitor patient's level of consciousness.

(2) Utilize supportive nursing measures.

(3) Consult infection control for recommendations regarding enteric precautions.

(4) Involve physical therapy for a formal evaluation and instruction.

(5) Determine the degree to which patient and family can participate in care.

(6) Continually observe family interactions to determine long-term effect of polio on family resources and dynamics.

(7) Seek assistance from Community Health Nurse for discharge planning and community assistance.

2-32. GUILLAIN-BARRE SYNDROME

a. **Definition.** Guillain-Barre Syndrome is a disorder of the nervous system that affects peripheral nerves and spinal nerve roots. It is also called infectious polyneuritis.

b. **Cause.** The exact cause of Guillain-Barre syndrome is unknown. Many patients give a history of a recent infection, especially of the upper respiratory tract. There is also evidence of a connection with the Swine flu vaccination. Diagnosis is made on the basis of the history and symptoms. Additionally, lumbar puncture will reveal increased protein in the CSF.

c. **Signs and Symptoms.**

(1) Motor weakness, especially in the extremities, is often the first symptom.

(2) Weakness usually progresses (ascends), over a period of several hours to one week, to the upper areas of the body, where muscles of respiration may be affected.

(3) Sensory disturbances, numbness, and tingling.

(4) Cranial nerve involvement resulting in difficulty chewing, talking, and swallowing.

(5) Diminished or absent deep tendon reflexes.

(6) Low grade fever.

d. **Nursing Management.**

(1) Treatment is nonspecific and symptomatic.

(2) Patient must be continuously observed for adequacy of respiratory effort.

(3) Continuous EKG monitoring.

(4) Supportive nursing care measures indicated by the patient's degree of paralysis.

(5) In several weeks, paralysis will begin to disappear, usually starting from the head and moving downward.

(6) Residual effects are rare, but prolonged flaccid paralysis may lead to muscle atrophy requiring rehabilitation and physical therapy.

Section VI. DEGENERATIVE NERVOUS SYSTEM DISORDERS

2-33. MULTIPLE SCLEROSIS

a. **Definition.** Multiple Sclerosis (MS) is a chronic, progressive disease of the central nervous system characterized by the destruction of myelin. Myelin is the fatty and protein material that covers certain nerve fibers in the brain and spinal cord.

(1) The cause of MS is unknown. Research is investigating the possibilities of infection by slow virus, alteration in the immune system, and genetic factors.

(2) Multiple Sclerosis primarily affects adults between 20 and 40 years of age.

b. **Signs and Symptoms.**

(1) Weakness.

(2) Visual disturbances (nystagmus, blurred vision, blindness).

(3) Slurred, hesitating speech.

(4) Intention tremor.

(5) Abnormal reflexes (absent or hyperactive).

(6) Ataxia.

(7) Paraplegia.

(8) Urinary and bowel incontinence/retention.

(9) Emotional lability; (depressed, euphoric).

c. **Medical and Nursing Management.**

(1) Objectives of care.

(a) To keep the patient as active and functional as possible in order to lead a purposeful life.

(b) To relieve the patient's symptoms and provide him/her with continued support.

(2) Instruct patient to perform muscle stretching exercises to minimize join contractures.

(a) Particular emphasis on hamstrings, gastrocnemius, hip adductors, biceps, wrist and finger flexors.

(b) Instruct family about passive range of motion exercises for patients with severe spasticity.

(c) Advise patient to prevent muscle fatigue with frequent rest periods.

(d) Instruct patient to participate in walking exercises to improve gait affected by loss of position sense in legs.

(e) Administer muscle relaxants as ordered.

(f) Utilize braces, canes, crutches, walkers when necessary to keep patient ambulatory.

(3) Avoid skin pressure and immobility.

(a) Pressure sores will accompany severe spasticity in an immobile patient due to sensory loss.

(b) Change patient's position every 2 hours even if patient is in wheelchair.

(c) Give careful attention to sacral and perineal hygiene.

(4) Support the patient with bladder disturbances.

(a) Observe patient closely for retention and catheterize, as ordered.

(b) Patient may need to be taught self-catheterization.

(c) Administer urinary antiseptics, as ordered.

(d) Support the patient with bladder incontinence by initiating a bladder training program.

(e) Meticulous skin care is required for the incontinent patient.

(5) Assist the patient to establish a routine of regular bowel evacuation.

(6) Administer corticosteroids, as ordered during periods of exacerbation.

(a) May reduce severity of exacerbation by reducing edema and inflammation.

(b) Encourage bedrest during the acute stage as activity seems to worsen attack.

(c) Keep in mind that the residual effects of the disease may increase with each exacerbation.

(7) Support the patient with optic and speech defects.

(a) Eye patch to block vision impulses for patient with diplopia.

(b) Obtain services of speech therapist.

(8) Discharge planning considerations.

(a) Instruct patient and family in activities of daily living using assistive and self-help aids.

(b) Assist the patient and family to cope with the stress of multiple sclerosis.

(c) The patient with MS will experience behavioral changes such as euphoria, depression, denial, and forgetfulness.

(d) Avoid physical and emotional stress as they may worsen symptoms.

(e) Assist patient to accept his new identity as a handicapped person.

2-34. AMYOTROPHIC LATERAL SCLEROSIS

a. **Definition.** Amyotrophic lateral sclerosis (ALS) is a progressive, incapacitating, and fatal disease of unknown cause. It is characterized by loss of motor neurons in the anterior horns of the spinal cord and lower brain stem. Amyotrophic lateral sclerosis is commonly known as Lou Gehrig's Disease.

b. **Signs and Symptoms.**

(1) Symptoms vary, depending upon the location of affected motor neurons.

(2) Progressive weakness and atrophy of muscles of arms, trunk, or legs.

(3) Progressive difficulty in speaking and swallowing, speech may be nasal and unintelligible.

(4) Excessive drooling.

(5) Muscle twitching.

(6) Mental facilities are not affected.

(7) Death usually occurs 3-5 years after onset.

c. **Medical and Nursing Management**

(1) Objective--to support the patient and improve quality of life.

(2) Instruct the patient to perform active exercises and range of motion exercises to strengthen uninvolved muscles and prevent disuse atrophy.

(3) Utilize braces, splints, canes, etc., to keep patient mobile as long as possible.

(4) Assist the patient to prevent complications that may result from symptoms.

(a) Keep suction apparatus at bedside, as aspiration is a constant danger.

(b) Instruct patient to drink and eat in an upright position with the neck flexed.

(c) Use soft cervical collar if patient has difficulty holding head up.

(d) Give semi-soft foods. Avoid easily-aspirated pureed foods and mucous producing foods (milk).

(e) Keep in mind that patient may have frequent outbursts of laughing and crying.

(f) Develop communication system when speech is lost.

(5) Give patient and family compassionate and caring support.

(a) Allow expressions of feelings and frustrations about losses and eventual outcome.

(b) Remember that the patient is alert and retains vision, ocular movement, intelligence, and consciousness even though he/she is paralyzed.

(c) Advise patient's family of helping services of ALS Society of America.

2-35. PARKINSON'S DISEASE

a. **Definition.** Parkinson's disease is a progressive neurological disorder affecting the brain centers that are responsible for control of movement.

(1) Primary degenerative changes of the basal ganglia and their connections prevent motor transmission of automatic movements (blinking, facial expressions, muscle tone).

(2) The exact cause of Parkinson's is unknown. Suspected causes include genetic factors, viruses, chemical toxicity, encephalitis, and cerebrovascular disease.

b. **Signs and Symptoms.**

(1) Bradykinesia, which usually becomes the most disabling symptom.

(2) Tremor which tends to decrease or disappear on purposeful movements.

(3) Rigidity, particularly of large joints.

(4) Classic shuffling gait.

(5) Muscle weakness which affects eating, chewing, swallowing, speaking, writing.

(6) Mask-like facial expression with unblinking eyes.

(7) Depression.

(8) Dementia.

c. **Medical and Nursing Management.**

(1) Treatment is based on a combination of the following:

(a) Drug therapy.

(b) Physical therapy.

(c) Rehabilitation techniques.

(d) Patient and family education.

(2) Encourage patient to participate in physical therapy and an exercise program to improve coordination and dexterity.

(a) Emphasize importance of a daily exercise program.

(b) Instruct patient in postural exercises and walking techniques to offset shuffling gait and tendency to lean forward.

(c) Encourage warm baths and showers to help relax muscles and relieve spasms.

(3) Instruct patient to establish a regular bowel routine with a high fiber diet and plenty of fluids. Constipation is a problem due to muscle weakness, lack of exercise, and drug effects.

(4) Eat a well-balanced diet. Nutritional problems develop from difficulty chewing and swallowing and dry mouth from medications.

(5) Encourage patient to be an active participant in his/her therapy and in social and recreational events, as Parkinsonism tends to lead to withdrawal and depression.

(6) Inform patient about American Parkinson's Disease Foundation for patient education and group support.

2-36. MYASTHENIA GRAVIS

a. **Definition.** Myasthenia Gravis is an autoimmune disorder affecting the neuromuscular transmission of impulses in the voluntary muscles of the body. In normal individuals, transmission of impulses from the nerve to the motor end plate of the muscle is accomplished by the transmitter substance acetylcholine.

(1) Acetylcholine is released at the nerve ending and moves to the muscle end plate, causing muscle contraction.

(2) Acetylcholine is then broken down into acetate and choline by the substance cholinesterase.

(3) In myasthenia gravis, one of three physiological abnormalities may exist:

(a) There may be too much cholinesterase present, and acetylcholine is destroyed too quickly.

(b) There may be too little acetylcholine released from the nerve fiber, resulting in inadequate depolarization of the motor end plate.

(c) The motor end plate is not sensitive to the action of acetylcholine.

b. **Signs and Symptoms.**

(1) Diplopia (double vision).

(2) Ptosis (dropping of one or both eyelids).

(3) Abnormal muscle weakness; characteristically worse after effort and improved by rest.

(4) Sleepy, mask-like facial expression with difficulty smiling.

(5) Speech weakness (high-pitched nasal voice).

(6) Difficulty swallowing.

(7) Choking, aspiration of food.

c. **Medical and Nursing Management.**

(1) Primary drug therapy (anticholinesterase drugs to enhance the action of acetylcholine at the myoneural junction).

(a) Drug must be given exactly on time to control symptoms.

(b) After initial medication adjustments are made, patient learns to take his medication according to his/her needs.

(2) Patient needs explicit instructions regarding medications.

(a) Actions.

(b) Reasons for timing.

(c) Dosage adjustment.

(d) Symptoms of overdosage and actions to take should crisis occur.

(3) Have mealtimes coincide with peak effect of anticholinergics, when ability to swallow is best.

(4) Obtain medic alert bracelet signifying that patient has myasthenia gravis.

(5) Wear an eyepatch over one eye (alternating from side to side) if diplopia occurs.

(6) Control factors which lead to fatigue.

(7) Emphasize importance of avoiding contact with individuals with colds or respiratory infections, since these conditions could be devastating to the myasthenic patient.

(8) Instruct patient to inform dentist of myasthenia condition since Novocaine is usually poorly tolerated.

(9) Instruct patient to rest at frequent intervals and avoid fatigue.

d. **Management of the Crises of Myasthenia.**

(1) Myasthenic crisis may result from natural deterioration of the disease, emotional upset, upper respiratory infection, surgery, or steroid therapy.

(2) Patient may be temporarily resistant to anticholinesterase drugs or need increased dosage.

(3) Cholinergic crisis may result from overmedication with anticholinergic drugs.

(4) Patient must be placed in an intensive care unit for continuous monitoring of the patient's respiratory status.

(5) Provide ventilatory assistance, endotracheal intubation, mechanical ventilation, if required.

(6) Administer appropriate medications, as determined by patient's status and cause of the crisis.

(7) Support patient's fluid and nutritional needs, as ordered and indicated by patient's condition.

(8) Give continued psychological support during crisis period, as patient is still alert.

Section VII. CRANIAL NERVE DISORDERS

2-37. BELL'S PALSY

a. **Definition.** Bell's Palsy is a cranial nerve disorder characterized by facial paralysis. Peripheral involvement of the 7th cranial nerve (facial nerve) produces weakness or paralysis of the facial muscles. The cause of this condition is unknown,

but the majority of patient's have experienced a viral upper respiratory infection 1 to 3 weeks prior to the onset of symptoms. Complications associated with Bell's palsy include facial weakness, facial spasm with contracture, corneal ulceration, and blindness.

b. **Signs and Symptoms.**

(1) Distortion of face.

(2) Numbness of face and tongue.

(3) Overflow of tears down the cheek from keratitis caused by drying of cornea and lack of blink reflex.

(4) Decreased tear production that may predispose to infection.

(5) Speech difficulty secondary to facial paralysis.

c. **Nursing Care Considerations.**

(1) Objectives of care:

(a) Maintain muscle tone of the face.

(b) Prevent or minimize denervation.

(2) Protect the involved eye.

(a) If blink reflex is absent, eye is vulnerable to dust and foreign particles.

(b) Instill artificial tears (methylcellulose) to protect the cornea.

(c) Increase environmental humidity.

(d) Instruct patient to close affected eye frequently using accessory facial muscles.

(e) Instruct patient to wear a protective patch at night. (Keep in mind that patch may eventually abrade cornea as paralyzed eyelids are difficult to keep closed.)

(f) Instruct patient to wear protective glasses to further protect eye and decrease normal evaporation of moisture from eye.

(3) Administer steroid therapy, as ordered. (May reduce inflammation and edema and restore normal blood circulation to the nerve.)

(4) Provide for pain relief with analgesics and local application of heat.

(5) Facial massage may be prescribed to help maintain muscle tone.

(6) Surgical intervention may be necessary.

(a) Decompression of facial nerve.

(b) Surgical correction of eyelid deformities.

2-38. TRIGEMINAL NEURALGIA

a. **Definition.** Trigeminal neuralgia, also known as Tic Douloureux, is a disorder of the 5th cranial nerve (trigeminal nerve). It is characterized by sudden paroxysms of burning pain along one or more of the branches of the trigeminal nerve. The pain alternates with periods of complete comfort.

b. **Signs and Symptoms.**

(1) Sudden, severe pain appearing without warning. (Along one or more branches of trigeminal nerve.)

(2) Numerous individual flashes of pain, ending abruptly and usually on one side of the face only.

(3) Attacks provoked by pressure on a "trigger point" (the terminals of the affected branches of the trigeminal nerve). Such triggers include:

(a) Shaving.

(b) Talking.

(c) Yawning.

(d) Chewing gum.

(e) Cold wind.

c. **Care Considerations.**

(1) Instruct patient to avoid exposing affected cheek to sudden cold if this is known to trigger the nerve. For example, avoid:

(a) Iced drinks.

(b) Cold wind.

(c) Swimming in cold water.

(2) Administer drug therapy, as ordered.

(a) Tegretol or Dilantin--relieves and prevents pain in some patients.

(b) Serum blood levels of drug are monitored in long term use.

(3) Surgical procedures to sever the affected nerve provide optimum pain relief with minimum impairment.

(4) Instruct patient in methods to prevent environmental stimulation of pain.

(a) Eat foods that are easily chewed and are served at room temperature.

(b) Avoids drafts and breezes.

Section VIII. HEAD AND SPINE INJURIES

2-39. HEAD INJURIES

a. **Direct and Indirect Head Injuries.** Head injuries are generally categorized as direct and indirect.

(1) Direct injuries result from a direct blow to the head.

(2) Indirect injuries result from the brain being jarred against the interior of the skull.

(3) Coup-contrecoup. This phenomenon is a combination of direct and indirect injury. A direct blow to one side of the skull causes the brain to be jarred inside the skull, causing an indirect injury on the side opposite the direct blow.

b. **Brain Damage.** Brain damage resulting from a head injury is dependent upon:

(1) The force of impact.

(2) The type of impact.

(3) The location of impact.

c. **Skull Fractures.** A skull fracture is a break in the continuity of the skull bones or a separation of the sutures.

(1) Basilar skull fractures are potentially serious injuries due to the proximity of the brain stem.

(2) Depressed skull fractures may be open or closed. In either case, the underlying brain tissue may be damaged.

(3) Linear skull fractures are "cracks." They may be dangerous if they overlie vascular structures.

d. **Hematomas.** Hematomas are a result of bleeding within the closed compartment of the skull. They may cause compression of brain tissue.

(1) Epidural hematoma is caused by bleeding between the skull and the dura.

(2) Subdural hematoma is caused by bleeding between the dura and the arachnoid membrane.

(3) Subarachnoid hemorrhage/hematoma is caused by bleeding into the subarachnoid space.

e. **Concussion**. Concussion results from violent jarring of the brain against the interior of the skull. The patient experiences a brief loss of consciousness followed by confusion, headache, and irritability. Complete recovery is usual.

f. **Contusion.** This injury is more serious than a concussion. The severe jarring of the brain causes bruising of the brain. (This bruising is the result of blood vessel rupture.) Permanent damage may result.

2-40. INCREASED INTRACRANIAL PRESSURE

a. **Definition.** The cranium is a closed cavity filled with contents that are virtually noncompressible. Rapid or prolonged increases in an intracranial pressure present a serious threat to life. This increased pressure may result from edema, bleeding, trauma, or space-occupying lesions. Once the pressure exceeds the accommodation point, the brain will herniate through weak points (for example, the foramen magnum). Irreversible neurological damage or death will result.

b. **Signs and Symptoms of Increased Intracranial Pressure.**

(1) Change in level of consciousness.

(a) May occur over a period of minutes, hours, or days.

(b) Characterized by a diminished response to environmental stimuli.

(c) Responsiveness ranges from alert and oriented to no response to stimuli.

(d) Confusion, restlessness, disorientation, and drowsiness may be signs of an impending change.

(2) Headache--increases in severity with coughing, sneezing, or straining at stool.

(3) Vomiting.

(4) Papilledema/pupil changes.

(a) Edema and pressure of both the optic nerve and the oculomotor nerve at the point at which they enter the globe is caused by venous congestion resulting from increased intracranial pressure.

(b) Pupil on the affected side may be nonreactive.

(c) Pupils may be unequal, dilated, pinpoint, or nonreactive.

(5) Elevation of blood pressure with a widened pulse pressure.

(6) Decreased pulse rate (may be increased initially).

(7) Decreased respiratory rate (may be irregular).

c. **Nursing Management.**

(1) Monitor vital signs closely.

(a) Accurately assess and document neurological status.

(b) Evaluation of alterations of consciousness is crucial since symptoms progress rapidly.

(2) Maintain patent airway.

(a) Intubation and hyperventilation may be indicated to provide adequate cerebral perfusion of oxygenated blood and decrease carbon dioxide induced vascular spasm.

(b) If patient is not intubated, position the patient on his side to decrease the possibility of airway occlusion; use oral or nasopharyngeal airway, prn.

(c) Be aware that stimulation of coughing when suctioning increases intracranial pressure and may precipitate seizure activity.

(3) Administer medications as ordered.

(a) Mannital (osmotic diuretic, to decrease cerebral edema).

(b) Corticosteroids (to reduce cerebral edema).

(c) Dilantin (as a precautionary measure to prevent seizure activity).

(d) Antibiotics.

(4) Elevate head of bed (30º).

(a) Promotes return of venous blood.

(b) Under no circumstances should patient's head be lower than the body.

(5) Administer hypertonic I.V. solutions as ordered.

(a) Dextrose in water (hypotonic) crosses the blood-brain barrier and increase cerebral edema and intracranial pressure.

(b) Fluids will be restricted to reduce intracranial pressure.

(c) Accurate intake and output records must be kept.

(6) Protect patient from injury should seizures occur.

(a) Pad side rails.

(b) Secure a tongue blade to the head of the bed for easy access.

(7) Maintain normal body temperature.

(a) Intracranial bleeding is frequently accompanied by increases in body temperature that are resistant to antipyretic agents.

(b) Monitor rectal temperature frequently.

(c) Place patient on hypothermia blanket, as ordered, for temperature over 102ºF.

d. **Patient Education.** Family members of patients who return home following injury to the head should be instructed to return the patient to the hospital if any of the following problems occur.

(1) Fever greater than 100ºF.

(2) Pulse less than 50 beats per minute.

(3) Vomiting.

(4) Slurred speech.

(5) Dizziness.

(6) Blurred or double vision.

(7) Unequal pupil size.

(8) Blood or fluid discharge from ears or nose.

(9) Increased sleepiness.

(10) Inability to move extremities.

(11) Convulsions.

(12) Unconsciousness.

2-41. SPINAL CORD INJURIES

a. Facts about Spinal Cord Injuries.

(1) Common causes of spinal cord injuries include:

(a) Automobile accidents.

(b) Athletic injuries (diving, hard-contact sports).

(c) Falls.

(d) Gunshot wounds, stab wounds.

(e) Industrial accidents.

(2) Common locations of spinal cord injuries.

(a) Flexion-extension injuries are commonly located at C_4 - C_7 ("whiplash").

(b) T_{11}, T_{12}, and L_1 are frequent sites of spinal cord injury resulting from falls.

(3) Mechanisms of spinal cord injury.

(a) Flexion-extension: whiplash, seen with rapid deceleration injuries.

(b) Subluxation: incomplete or partial dislocation.

(c) Torsion: twisting of the spinal cord.

(d) Compression.

(4) Pathophysiological changes associated with spinal cord injuries.

(a) Damage to the cord may be a concussion, contusion, laceration, compression, or complete transection of the cord.

(b) Cord's response to injury includes hemorrhage, ischemia, and edema.

b. **Signs and Symptoms.**

(1) Patient's symptoms will mirror the level of the cord injury.

(2) There will be total sensory loss and motor paralysis below level of the injury.

(a) Cervical spinal cord injuries will produce quadriplegia--loss of function of all four extremities.

(b) Injuries to the thoracic spinal cord below the level of T_1 will produce paraplegia--paralysis of the lower extremities.

(3) Loss of bowel and bladder control; usually urinary retention and bladder distention.

(4) Loss of sweating and vasomotor tone below the level of the cord injury.

(5) Marked reduction of blood pressure due to loss of peripheral vascular resistance.

(6) Neck/back pain.

(7) Priapism--persistent, painful erection of the penis.

c. **Medical and Nursing Management.**

(1) Objectives of care:

(a) Reduce the fracture/dislocation and obtain immobilization of the spine as soon as possible to prevent further cord damage.

(b) Observe for symptoms of progressive neurological damage.

(2) Maintain patient on a turning frame or Circo-lectric bed to maintain spinal alignment.

(3) Patient with cervical spine injury will have some form of skeletal traction. Maintain traction and provide nursing care IAW local policy.

(4) Continuously observe patient's breathing pattern.

(a) Patients with injuries at high levels are at risk for respiratory failure.

(b) Observe strength of cough effort.

(5) Continuously observe patient for motor and sensory changes due to cord edema or hemorrhage, which may further compromise cord function.

(a) Test patient's motor ability by asking him/her to spread fingers, grip your hands, shrug shoulders, etc.

(b) Test sensory level by gently pinching the skin at shoulders and progressing down sides; ascertain level at which patient can no longer feel pinch.

(c) Note presence/absence of sweating.

(d) Carefully record findings in patient's clinical record; report changes in patient's motor/sensory level immediately to professional nurse.

(6) Be alert for signs of spinal shock and report immediately.

(a) Spinal shock represents a sudden loss of continuity between the spinal cord and higher nerve centers.

(b) It is characterized by a complete loss of motor, sensory, reflex, and autonomic activity below the level of the injury.

(c) Though temporary, spinal shock may last for several weeks.

(7) If turning is allowed and patient is not on a turning frame or turning bed, the patient must be carefully log-rolled with the spine maintained in alignment.

(8) Surgery, depending upon the injury and pathological findings, may have to be performed to stabilize the spine before rehabilitation can begin.

(9) Patient will require passive range of motion exercises.

(10) Assist with active rehabilitation procedures when patient is stable.

(a) Program is designed according to neurological deficit.

(b) Usually involves 6 weeks of gradual mobilization with brace or cast, depending upon level of injury.

(11) Provide constant encouragement and psychological support to the patient with a spinal cord injury.

Section IX. DISORDERS OF THE BRAIN

2-42. CEREBRAL VASCULAR ACCIDENT)

a. **Definition.** Cerebral vascular accident (CVA) (stroke) is the disruption of the blood supply to the brain, resulting in neurological dysfunction.

b. **Causes of Cerebral Vascular Accidents.**

(1) Thrombosis--blood clot within a blood vessel in the brain or neck.

(2) Cerebral embolism.

(3) Stenosis of an artery supplying the brain.

(4) Cerebral hemorrhage--rupture of a cerebral blood vessel with bleeding/pressure into brain tissue.

c. **Risk Factors Associated with Cerebral Vascular Accidents.**

(1) Hypertension.

(2) Previous transient ischemic attacks.

(3) Cardiac disease (atherosclerosis, arrhythmias, valvular heart disease).

(4) Advanced age.

(5) Diabetes.

d. **Signs and Symptoms.**

(1) Highly dependent upon size and site of lesion.

(2) Motor loss--hemiplegia (paralysis on one side of the side) or hemiparesis (motor weakness on one side of the body).

(3) Communication loss.

(a) Receptive aphasia (inability to understand the spoken word).

(b) Expressive aphasia (inability to speak).

(4) Vision loss.

(5) Sensory loss.

(6) Bladder impairment.

(7) Impairment of mental activity.

(8) In most instances onset of symptoms is very sudden.

(a) Level of consciousness may vary from lethargy, to mental confusion, to deep coma.

(b) Blood pressure may be severely elevated due to increased intracranial pressure.

(c) Patient may experience sudden, severe, headache with nausea and vomiting.

(d) Patient may remain comatose for hours, days, or even weeks, and then recover.

(e) Generally, the longer the coma, the poorer the prognosis.

(9) Increased intracranial pressure is a frequent complication resulting from hemorrhage or ischemia and subsequent cerebral edema.

e. **Medical and Nursing Management during the Acute Phase of Cerebral Vascular Accidents.**

(1) Objectives of care during the acute phase:

(a) Keep the patient alive.

(b) Minimize cerebral damage by providing adequately oxygenated blood to the brain.

(2) Support airway, breathing, and circulation.

(3) Maintain neurological flow sheet with frequent observations of the following:

(a) Level of consciousness.

(b) Pupil size and reaction to light.

(c) Patient's response to commands.

(d) Movement and strength.

(e) Patient's vital signs--BP, pulse, respirations, and temperature.

(f) Be particularly aware of changes in any of the above. Deterioration could indicate progression of the CVA.

(4) Continually reorient patient to person, place, and time (day, month) even if patient remains in a coma. Confusion may be a result of simply regaining consciousness, or may be due to a neurological deficit.

(5) Maintain proper positioning/body alignment.

(a) Prevent complications of bed rest.

(b) Apply foot board, sand bags, trochanter rolls, and splints as necessary.

(c) Keep head of bed elevated 30º, or as ordered, to reduce increased intracranial pressure.

(d) Place air mattress or alternating pressure mattress on bed and turn patient every two hours to maintain skin integrity.

(6) Ensure adequate fluid and electrocyte balance.

(a) Fluids may be restricted in an attempt to reduce intracranial pressure (ICP).

(b) Intravenous fluids are maintained until patient's condition stabilizes, then nasogastric tube feedings or oral feedings are begun depending upon patient's abilities.

(7) Administer medications, as ordered.

(a) Antihypertensives.

(b) Antibiotics, if necessary.

(c) Seizure control medications.

(d) Anticoagulants.

(e) Sedatives and tranquilizers are <u>not</u> given because they depress the respiratory center and obscure neurological observations.

(8) Maintain adequate elimination.

(a) A Foley catheter is usually inserted during the acute phase; bladder retraining is begun during rehabilitation.

(b) Provide stool softeners to prevent constipation. Straining at stool will increase intracranial pressure.

(9) Include patient's family and significant others in plan of care to the maximum extent possible.

(a) Allow them to assist with care when feasible.

(b) Keep them informed and help them to understand the patient's condition.

f. **Rehabilitation of the Patient after a Cerebral Vascular Accidents.**

(1) Multidisciplinary team is most frequently utilized.

(2) Process of setting goals for rehabilitation must include the patient. This increases the likelihood of the goals being met.

(3) General rehabilitative tasks faced by the patient include:

(a) Learning to use strength and abilities that are intact to compensate for impaired functions.

(b) Learning to become independent in activities of daily living (bathing, dressing, eating).

(c) Developing behavior patterns that are likely to prevent the recurrence of symptoms.

1 Taking prescribed medications.

2 Stopping smoking.

3 Reducing day-to-day stress.

4 Modifying diet.

(4) Specific teaching, encouragement, and support are needed.

(5) Individualized exercise program involving both affected and unaffected extremities is required.

(6) Speech therapy, as indicated by patient's condition, may be necessary.

(7) Continuous revaluation of goals and patient's ability to meet the goals is required to maintain a realistic plan of care.

(8) Counseling and support to family is an integral part of the rehabilitation process.

(a) Both family and patient need direction and support in coping with intellectual and personality impairment.

(b) Instruct family to expect some emotional lability such as inappropriate crying, laughing, or outbursts of temper.

(c) Instruct family to be supportive and optimistic, but firm as well. They must avoid doing things for the patient that he can do for himself.

2-43. EPILEPSY

a. **Definition.** Epilepsy is an abnormal electrical disturbance in one or more areas of the brain. An estimated 2 to 4 million persons in the United States are afflicted with epilepsy and more that half of those are under 20 years of age.

(1) The basic problem is thought to be an electrical disturbance in the nerve cells in one section of the brain, causing them to give off abnormal, recurrent, uncontrolled electrical discharges that produce a seizure or convulsion.

(2) The underlying disorder may be structural, chemical, physiological, or a combination of all three.

(3) Factors that may predispose a patient to epilepsy/seizures.

(a) Trauma to the head/brain.

(b) Brain tumor.

(c) Circulatory disorder, stroke.

(d) Metabolic disorder (such as hypoglycemia, hypocalcemia, or cerebral anoxia).

(e) Drug/alcohol toxicity.

(f) Infection (meningitis/brain abscess).

b. **Grand Mal Seizure.** (Characterized by three phases.)

(1) Preictal phase.

(a) Consists of vague emotional changes (depression, anxiety, nervousness).

(b) Lasts for minutes to hours. Followed by an "aura."

(c) Aura is usually a sensory "cue" (odor or sound) or sensation "cue" (weakness, numbness). It is related to the anatomical origin of the seizure, and warns the patient that a seizure is imminent.

(d) Preictal phase may or may not be present in all patients.

(2) Tonic-clonic phase.

(a) Loss of consciousness.

(b) Skin may become cyanotic, breathing is spasmodic, jaws are tightly clenched, and tongue and inner teeth may be bitten.

(c) Urinary and fecal incontinence usually occur.

(d) Phase may last one or more minutes.

(e) Tonic activity is characterized by rigid contraction of the muscles.

(f) Clonic activity is characterized by alternate contraction and relaxation of muscles, causing jerking movements of the arms and legs.

(3) Postictal phase.

(a) Phase will vary in symptoms.

(b) Many patients fall into a deep sleep which may last for several hours.

(c) Patient may experience headache, fatigue, confusion, and nausea.

c. **Petit Mal Seizure.**

(1) Characterized by brief loss of consciousness, or "blank spells."

(2) Individual stares blankly, eyelids may flutter, and there is slight movement of head and extremities.

(3) More common in children.

(4) May occur dozens of times per day.

d. **Psychomotor Seizure.**

(1) Different forms of seizure activity often appearing as irrational or odd behavior, such as removing one's clothing or purposeless behaviors such as smacking one's lips.

(2) Last only a few moments and individual has no recall of behavior.

(3) Auditory, visual, or olfactory hallucinations may also occur.

e. **Jacksonian Seizure.** (Also called focal or marching seizures.)

(1) Seizures may start in one part of the body and move to another.

(2) Consciousness may not be lost.

(3) May be followed by a grand mal seizure.

f. **Status Epilipticus.**

(1) Series of grand mal seizures experienced by the patient without regaining consciousness.

(2) Extreme neurological emergency.

(3) May occur spontaneously or if anticonvulsant medications are suddenly stopped.

g. **Medical and Nursing Management.**

(1) Objectives of care:

(a) Determine and treat underlying cause of seizures if possible.

(b) Prevent recurrence of seizures and therefore allow patient to live a normal life.

(2) Institute and reinforce the importance of anticonvulsant drug therapy:

(a) Drug therapy is a means of controlling the condition; it is not a cure.

(b) Initially, dosage will have to be monitored and altered to provide maximum control with minimum side effects.

(3) Instruct patient to keep record of events surrounding his/her seizures (number, duration, time, sleep/eating patterns).

(4) Use of multidisciplinary approach to cope with social, emotional, and vocational pressures of the person with epilepsy.

(5) Place a padded tongue blade and oral airway at the patient's bedside. Tape them to the headboard or wall above the bed. This provides easy emergency access.

(6) Take the seizure prone patient's temperature with a rectal thermometer; prevents possibility of patient biting an oral thermometer if a seizure should occur.

(7) Set up suction equipment at the patient's bedside.

(a) Check the equipment daily to be sure it is working properly.

(b) Use during or after a seizure to clear the patient's airway.

(8) Essential steps necessary to protect the patient during a seizure.

(a) Turn patient on his side to provide for drainage of oral secretions.

(b) Do not forcibly restrain patient during seizure.

(c) Remove objects that may obstruct breathing or cause injury to patient.

(d) Protect patient's head from injury with pillow, blanket, etc.

(9) Essential steps necessary to ensure safety of the patient following a seizure.

(a) Keep bed flat and patient turned on his side until he is alert.

(b) Room lighting should be dim and noise kept to a minimum.

(c) Loosen restrictive clothing (if not done during seizure).

(d) Check vital signs immediately following seizure and every 30 minutes (or as ordered) until patient is alert.

(e) Check lips, tongue, and inside of mouth for injuries.

(f) If patient is incontinent, change clothing and bedding with as little disturbance as possible.

h. **Documentation.**

(1) Document all precautions taken.

(2) Document all activity observed during a seizure, to include the time, location, circumstances, length of seizure activity, and vital signs.

(3) Document any injury sustained during a seizure.

2-44. BRAIN TUMOR

a. **Definition.** A brain tumor is a localized intracranial lesion which occupies space with the skull and tends to cause a rise in intracranial pressure.

b. **Signs and Symptoms.**

(1) A brain tumor is usually characterized by a progressive course of symptoms over a period of time.

(2) Symptoms depend primarily on the location of the mass within the cranium.

(3) Symptoms related to increased intracranial pressure will occur.

(a) Decrease in level of consciousness.

(b) Confusion.

(c) Headache.

(d) Lethargy.

(e) Vomiting.

(f) Papilledema--edema of optic nerve.

(4) Alterations in mentation.

(5) Aphasia.

(6) Hemiparesis.

(7) Visual field defects.

(8) Sensory defects (smell, hearing).

(9) Seizures.

c. **Preoperative Medical and Nursing Management.**

(1) Instruct patient and family about the necessity and importance of diagnostic tests to determine the exact location of the tumor.

(2) Monitor and record vital signs and neurological status accurately q2-4h, or as ordered. Report changes to professional nurse immediately.

(3) Institute measures to prevent inadvertent increases in intracranial pressure.

(a) Elevate head of bed 30º.

(b) Stool softeners to prevent straining at stool (which increases intracranial pressure).

(4) Institute seizure precautions at patient's bedside. (Tongue blade airway.)

(5) Supportive nursing care is given depending upon the patient's symptoms and ability to perform activities of daily living.

(6) Administer all doses of steroids and antiepileptic agents on time.

(a) Withholding steroids can result in adrenal crisis.

(b) Withholding of antiepileptic agents frequently precipitates seizure.

(7) Surgery (craniotomy) is performed to remove neoplasm and alleviate symptoms.

d. **Post Operative Nursing Care Considerations.**

(1) Meticulous nursing management and care aimed at prevention of postoperative complications are imperative for the patient's survival.

(2) Accurately monitor and record all vital signs and neurological signs.

(a) Postoperative cerebral edema peaks between 48 and 60 hours following surgery.

(b) Patient may be lucid during first 24 hours, then experience a decrease in level of consciousness during this time.

(3) Administer artificial tears (eye drops) as ordered, to prevent corneal ulceration in the comatose patient.

(4) Maintain skin integrity.

(5) Bone flap may not have been replaced over surgical site; turning patient to the affected side, if the flap has been removed, can cause irreversible damage in the first 72 hours.

(6) Maintain head of bed at 30ºelevation.

(7) Perform passive range of motion exercises to all extremities every 2-4 hours.

(8) Maintain body temperature.

(a) Increases of body temperature in the neurosurgical patient may be due to cerebral edema around the hypothalamus.

(b) Monitor rectal temperature frequently.

(c) Place patient on hypothermia blanket, as ordered.

(9) Institute seizure precautions at patient's bedside. (Tongue blade, airway.)

(10) Maintain accurate record of intake and output.

(11) Prevent pulmonary complications associated with bedrest.

(a) Cough and deep breath every 2 hours.

(b) Perform gentle chest percussion, with the patient in the lateral decubitus position, if tolerated.

(12) Continuously talk to the patient while providing care, reorienting him to person, place, and time.

2-45. CONCLUSION

a. This lesson has introduced the basic nursing care techniques and procedures involved in the nursing care related to the neurological system.

b. Review the lesson objectives once again. If you feel confident that you have achieved the lesson objectives, complete the exercises at the end of this lesson.

c. If you do not feel that you have met the lesson objectives, review the necessary material before you attempt the end of lesson exercises.

Continue with Exercises

EXERCISES, LESSON 2

INSTRUCTIONS: Answer the following exercises by marking the lettered response that best answers the question, by completing the incomplete statement, or by writing the answer in the space provided at the end of the question.

After you have completed all of these exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. The central nervous system is composed of the _____ and the _____.

2. There are ____ pairs of cranial nerves which exit from the _____.

3. There are ____ pairs of spinal nerves which exit from the _____.

4. The protective membrane covering is composed of three layers called the _____, _____, and _____.

5. Cerebrospinal fluid is found in the _____, _____, and _____ .

6. The part of the brain concerned with coordination of impulses to voluntary muscles is the _____.

7. The _____ contains nerve centers for vital functions such as cardiac and respiratory function.

8. Personality, intellectual functioning, and creative thinking are functions of the _____ of the cerebrum.

9. Stereogenesis and discrimination of fine touch are functions of the _____. lobe.

10. The _____ lobe receives and interprets visual stimuli.

11. The brain and spinal cord together are referred to as the _____.

12. "Gray matter" is actually _____ .

13. Each spinal nerve has _____ and _____ roots.

14. An afferent neuron carries _____ information from the _____ to the _____.

15. An automatic reaction to a stimulus is called a _____.

16. In a reflex arc, the afferent neuron synapses with the _____, which in turn synapses with the _____.

17. Constriction of the pupils, gastrointestinal motility, and dilation of blood vessels are functions of the _____.

18. The two divisions of the ANS are the _____ and the _____..

19. The interplay of the two divisions of the ANS maintains _____.

20. Under conditions of stress, the _____ dominates the body and creates the _____ response.

21. When assessing mental status, asking the patient to perform calculations is a method of testing _____ .

22. When assessing mental status, questioning a patient about what he ate for breakfast is a way to evaluate _____.

23. A procedure used to determine the pressure of CSF or to relieve intracranial pressure is the _____.

24. When caring for the unconscious patient, always assume that the patient can _____-------____, even though he makes no response.

25. When an unconscious patient must be left unattended, the best position in which to place the patient to maintain an open airway is the _____.

26. A disorder of the nervous system that affects peripheral nerves and spinal nerve roots is called _____.

27. Elevation of the blood pressure with a widening pulse pressure, pupillary changes, and headache are symptomatic of _____.

28. When caring for a patient with increased intracranial pressure, the head of the bed should be _____.

29. Priapism is a sign of _____.

30. A patient who displays signs and symptoms including hemiplegia, expressive aphasia, elevated blood pressure, and altered levels of consciousness has most likely experienced a _____.

31. A seizure that is characterized by preictal, tonic-clonic, and postictal phases is called _____.

32. A sensation of weakness, odor, or sound that precedes a seizure is called _____.

33. A chronic, progressive disease of the central nervous system, characterized by destruction of myelin is called _____.

34. The eyes of an unconscious patient may become irritated, infected, or damaged due to the absence of the _____ and _____.

35. "White matter" is actually _____.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 2

1. Brain; spinal cord (para 2-1a(1))

2. 12; Brainstem (para 2-5b(1))

3. 31; Spinal cord (para 2-5b(2))

4. Dura mater; Arachnoid mater; Pia mater (para 2-2)

5. Ventricles of the brain (para 2-2d(2))
   Subarachnoid space (para 2-2d(2))
   Central canal of the spinal cord (para 2-4e)

6. Cerebellum (para 2-3b(3))

7. Medulla (para 2-3a(3)(b))

8. Frontal lobe (para 2-3c(1))

9. Parietal (para 2-3c(2))

10. Occipital (para 2-3c(4))

11. Neuraxis (para 2-4a)

12. Cell bodies of neurons (para 2-3b(1), 2-3c, 2-4c)

13. Anterior (motor); Posterior (sensory) (para 2-2b(1))

14. Sensory; periphery; CNS (para 2-2c(1))

15. Reflex (para 2-9)

16. Internuncial neuron; Efferent neuron (para 2-9)

17. ANS (autonomic nervous system) (para 2-10a)

18. Sympathetic nervous system (thoraco-lumbar outflow); (para 2-10d)
    Parasympathetic nervous system (cranio-sacral outflow) (para 2-10d)

19. Homeostasis (equilibrium) (para 2-10e)

20. Sympathetic nervous system; fight or flight (para 2-10e(1))

21. Cognition (para 2-13d)

22. Short-term memory (recent recall) (para 2-13c)

23. Lumbar puncture (para 2-18a,b)

24. Hear (para 2-22c)

25. The coma position (para 2-23a(1)(2))

26. Guillain-Barre Syndrome (or infectious polyneuritis) (para 2-32a)

27. Increased intracranial pressure (para 2-40b(2)(4)(5))

28. Elevated (para 2-40c(4))

29. Spinal cord injury (para 2-41b(7))

30. Cerebral vascular accident (para 2-42d(2)(3)(8)

31. Grand mal (para 2-43b)

32. An aura (para 2-43b)

33. Multiple sclerosis (para 2-33a)

34. Blink reflex; tearing (para 2-25e)

35. Myelin covered processes of neurons (para 2-3b(2), 2-3c, 2-4f)

End of Lesson 2